WATER WORKS & SEWERAGE

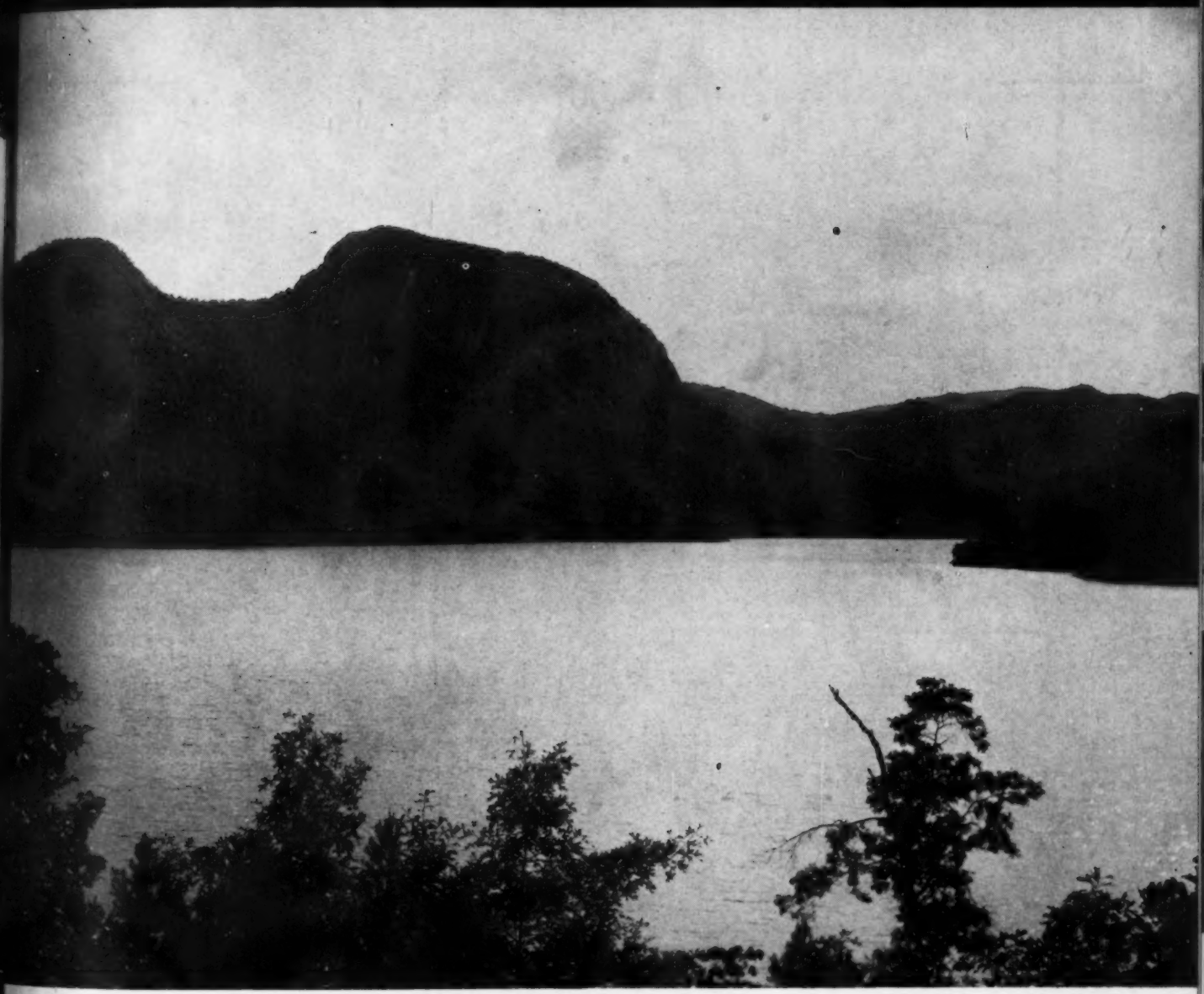
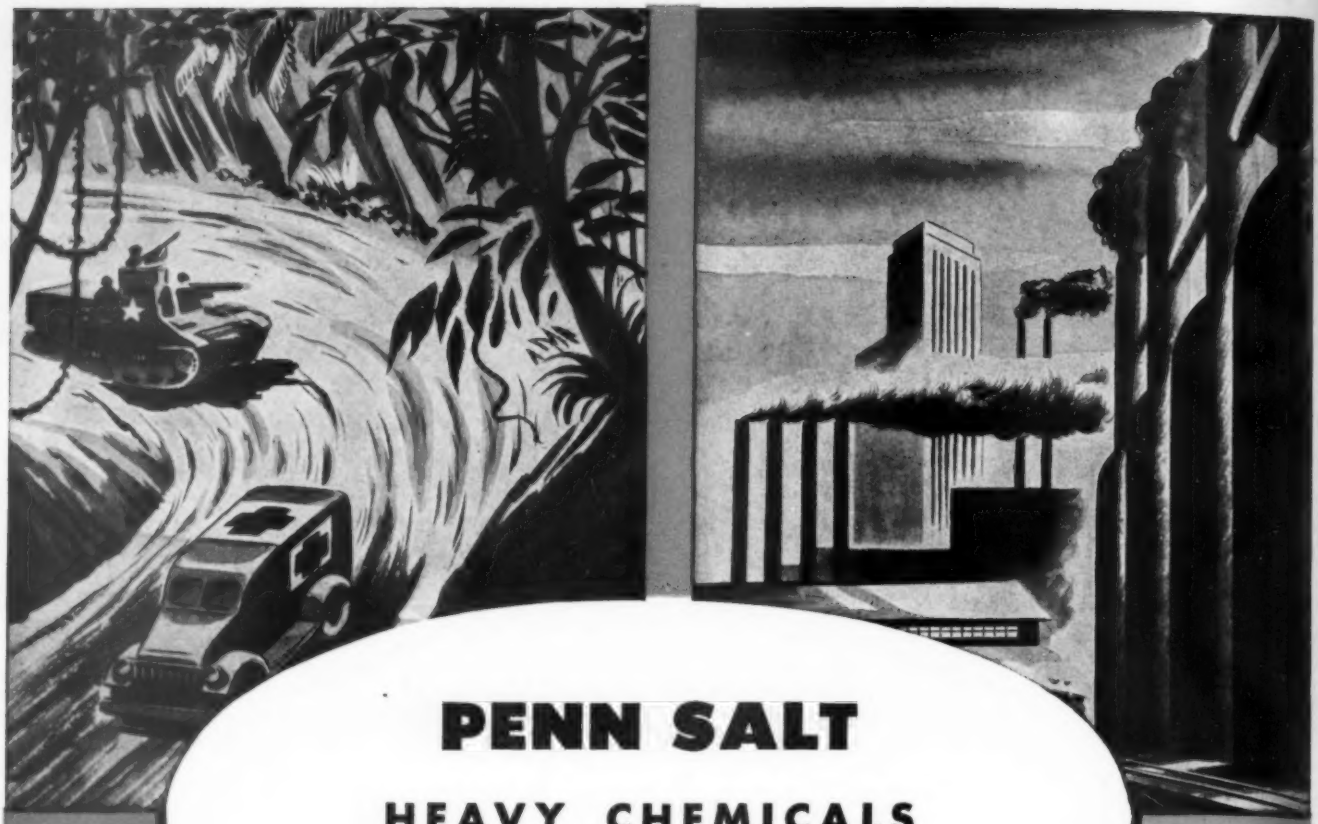


TABLE ROCK MOUNTAIN RESERVOIR
(9,522,000,000 Gallons of Soft Mountain Water)
GREENVILLE'S GREATEST ASSET



PENN SALT

HEAVY CHEMICALS AT WAR

Penn Salt
manufactures
Liquid Chlorine
for water sanitation and
sewage treatment

Also
Perchloron* • Anhydrous Ammonia
Filter Alum • Ferric Chloride
Sodium Aluminate • Chloride of Lime
Caustic Soda and other products
*Trade-mark Reg. U. S. Pat. Off.

PENN SALT CHLORINE and PERCHLORON* are on duty at the battlefronts around the world—in the training camps—at every bridgehead . . . protecting our fighting men against the dangers of water-borne disease . . . serving the medical corps as bactericides . . . sanitizing clothes and supplies in camp laundries . . . guarding soldiers' feet against infection.

OTHER PENN SALT PRODUCTS are doing other vital wartime jobs in many fields. They are used in the manufacture of explosives—in the making of textiles for military supplies—as important new materials for gas mask canisters—in substantial amounts for the pulp and paper industry—and in even greater quantities for chemicals and soaps.

These needs for Penn Salt heavy chemicals may sometimes limit our supply for other purposes—but our wartime activities mean expanded production and greater service facilities, to serve you better when the war is won.

PENNSYLVANIA SALT
MANUFACTURING COMPANY
Chemicals

1000 WIDENER BUILDING, PHILADELPHIA 7, PA.

NEW YORK • CHICAGO • ST. LOUIS • PITTSBURGH • MINNEAPOLIS • WYANDOTTE • TACOMA

WATER WORKS & SEWERAGE, April, 1944, Volume 91, Number 4. Published monthly by Gillette Publishing Co., 330 South Wells Street, Chicago, Ill. Per copy, 25c. Subscription rate, United States, $2.00 per year; Canada, $2.00 per year; Foreign, $3.00 per year Entered as Second Class Matter, June 2, 1931, at the Post Office at Chicago, Ill., under act of March 3, 1879.

Tops in WAR-TIME MEASUREMENT VALUE

It is only natural to expect the best in war-time meters from the organization best equipped to design and produce them. Pittsburgh-National, with facilities unequalled in the industry, has done the outstanding job.

By the ingenious use of rust-proofed iron and tempered glass, in case and register box, over 70 percent of the bronze normally required has been eliminated. This has been accomplished without changing in the least any part of the proven working mechanisms.

In peace or war meter buyers can always look to Pittsburgh-National for top measurement value.

V

An iron case domestic water meter employing the famous Empire balanced, oscillating piston principle of measurement. Has molded glass index box and breakable frost bottom. Interior parts interchangeable with the Empire Streeemline Meter making conversion to bronze cases possible after the war if desired.

IRONSIDE

The Ironside is the cast iron war-model counterpart of the well known Arctic Meter. The working mechanism is directly interchangeable making conversion to bronze cases possible after the emergency is over. This meter is of the popular disc type with proven operating parts unchanged.

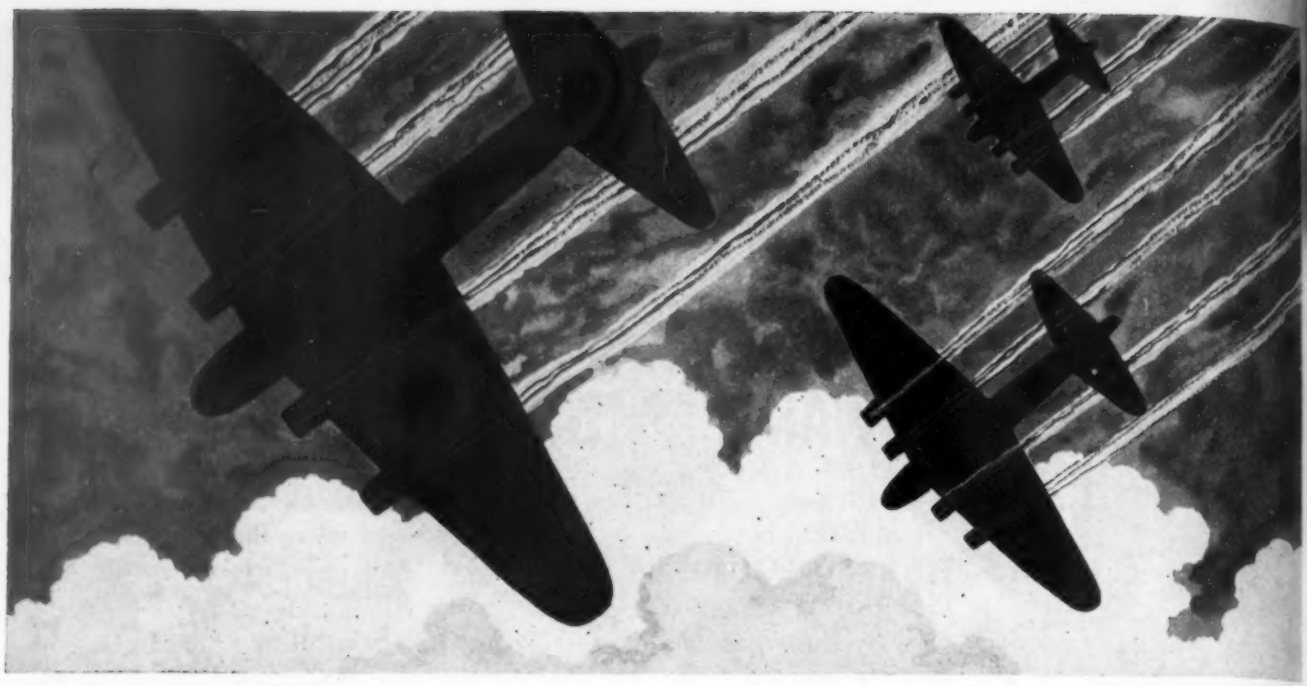
PITTSBURGH EQUITABLE METER COMPANY

ATLANTA BOSTON BROOKLYN BUFFALO CHICAGO COLUMBIA HOUSTON

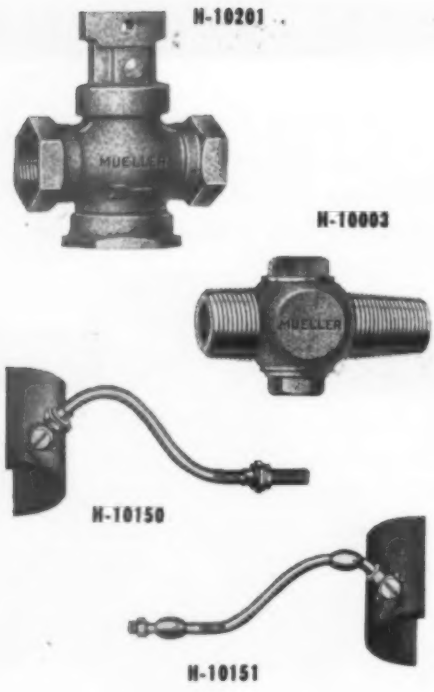
MERCO NORDSTROM VALVE COMPANY
Main Offices, Pittsburgh, Pa.
NATIONAL METER DIVISION, Brooklyn, N. Y.

KANSAS CITY LOS ANGELES NEW YORK PITTSBURGH SAN FRANCISCO SEATTLE TULSA

Water Meters



ACE HIGH



There is no finer group of fighting flyers anywhere than our own U. S. Air Forces. They are far superior to anything the enemy has to offer. And what a licking they can give. . . . When it comes to licking the chemical reactions of the soil; the shock, hammer, strain, and vibration that punish a curb stop or gooseneck there is none superior to the MUELLER line of waterworks brass goods. Take these stops, for example. The right mixture of metals gives long life. Keys are individually ground into their bodies to prevent leaks and sticking. Extra thickness in the right spots curb breakage under strain or settling. Clean cut threads mean tight joints. All goosenecks have heavy lead pipe. Wiped joints are made by experienced men. The lead-flange model has PATENTED knurled joints with the bull dog grip. Can't pull out. . . . Such features as these make the MUELLER line ace high with all water works men. Write today and tell us your needs.

★

Founded 1857

MUELLER CO.

DECATUR 70, ILL.

Diamond Liquid Chlorine

PREFERRED

BY EXPERIENCED WATERWORKS ENGINEERS *Everywhere*

...for dependable water purification and sanitation

The more experience a waterworks engineering executive has with DIAMOND LIQUID CHLORINE, the more strongly he insists on always getting Diamond. Its dependable, uniform purity helps in the vital job of maintaining an adequate supply of pure water.

DIAMOND ALKALI COMPANY
PITTSBURGH, PA., *and Everywhere*

ALKALI

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The theory, practice and equipment for grit removal.

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Complete information on the removal and cutting of screenings.

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Information on pumps, sludge pumping, typical piping layout and pipe friction curves for sludge.

AMERICAN
ESTABLISHED 1868
THE AMERICAN WELL WORKS
Manufacturers of
PUMPING · SEWAGE TREATMENT · WATER PURIFICATION EQUIPMENT ·
RESEARCH · ENGINEERS · MANUFACTURERS · Factory and Laboratories · · · AURORA, ILLINOIS

FROM THE HONOR ROLL...TO THE PAY ROLL

WHEN THE VICTORY whistles blow and our boys come home, it's up to every city and town to transfer each man's name from the Honor Roll to the Pay Roll. One way your community can accomplish this is to plan Public Works Programs NOW . . . which will give your own men plenty of jobs right in your own home town.

On water supply, sewerage and drainage projects the Lock Joint Pipe Company is prepared to come into your town, set up local temporary plants and employ up to 90% local labor. Your merchants will also benefit through the local purchase of a large quantity of supplies and materials. As a result, a substantial part of the cost of the project will be redistributed in your own community.

The use of Reinforced Concrete Pipe will not only give immediate employment to some of your engineers, mechanics, laborers, and other skilled workers . . . BUT it will bring absolute assurance that your pipeline problems of corrosion, tuberculation and maintenance are completely and permanently solved.

Whether your project is large or small, for the present or the future, your 'phone call, telegram, cable or letter to any of our offices will bring a prompt reply.

LOCK JOINT PIPE COMPANY

Established 1905

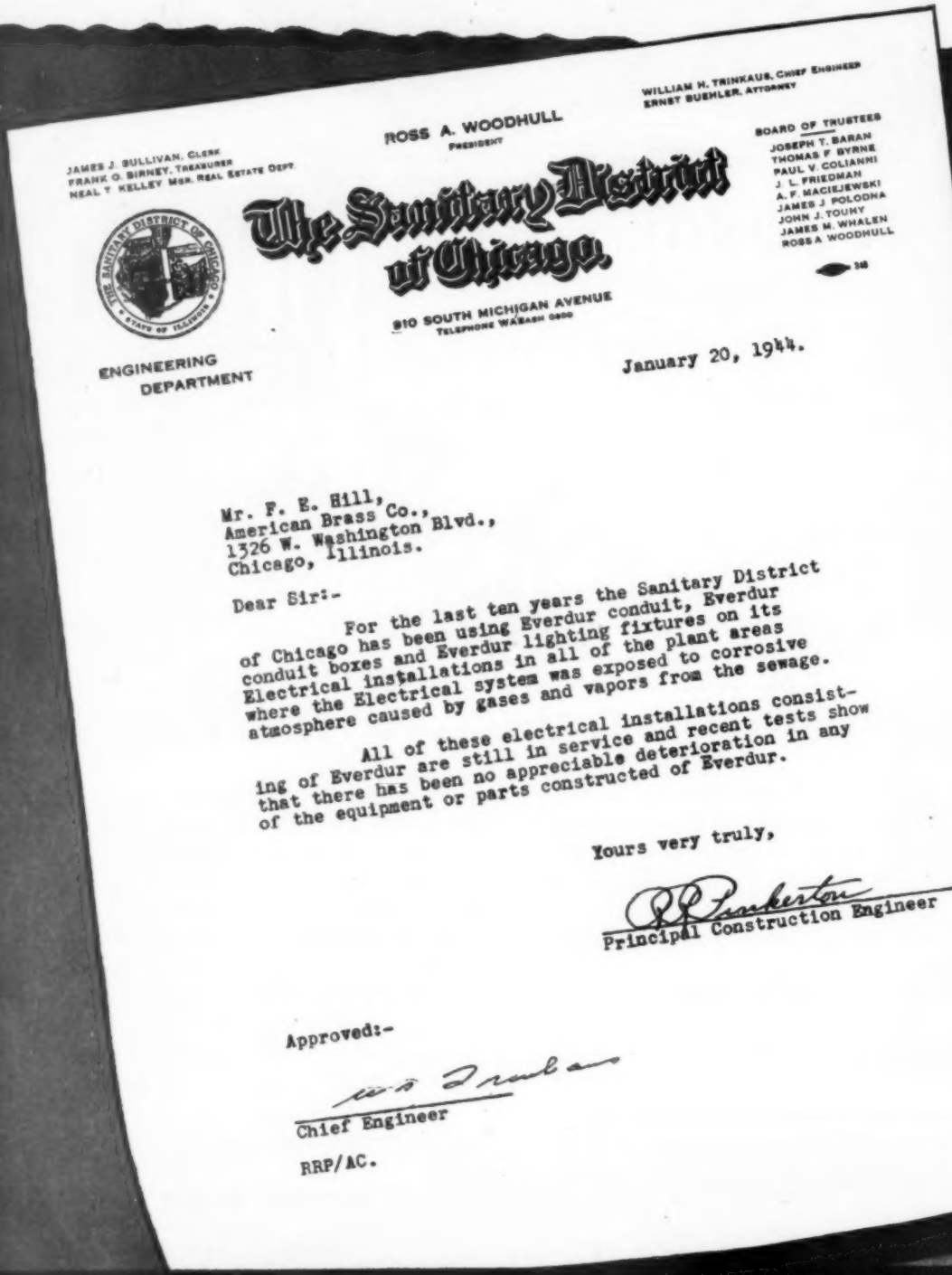
AMPERE, NEW JERSEY

Denver, Colo. · Chicago, Ill. · Kenilworth, N. J. · Kansas City, Mo. · Rock Island, Ill. · Joplin, Mo. · Valley Park, Mo. Cleveland, Ohio · Hartford, Conn. · Navarre, Ohio

SCOPE OF SERVICES *Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply Mains as well as Concrete Pipe of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous lines.*

LOCK JOINT
Reinforced Concrete
PRESSURE PIPE

"No appreciable deterioration or parts constructed



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The Sanitary District of Chicago.

910 SOUTH MICHIGAN AVENUE
Telephone WABash 0800

ENGINEERING DEPARTMENT

January 20, 1944.

Mr. F. E. Hill,
American Brass Co.,
1326 W. Washington Blvd.,
Chicago, Illinois.

Dear Sir:-

For the last ten years the Sanitary District of Chicago has been using Everdur conduit, Everdur conduit boxes and Everdur lighting fixtures on its Electrical installations in all of the plant areas where the Electrical system was exposed to corrosive atmosphere caused by gases and vapors from the sewage.

All of these electrical installations consisting of Everdur are still in service and recent tests show that there has been no appreciable deterioration in any of the equipment or parts constructed of Everdur.

Yours very truly,

R. R. Pemberton
Principal Construction Engineer

Approved:-

Chief Engineer

RRP/AC.

ANACONDA *Anaconda Copper & Copper Alloys*

in any of the equipment of Everdur*"

Mr. Pinkerton's letter speaks ably for the 14 miles of Everdur* Conduit and 20,000 lb. of Everdur fittings and boxes in Chicago's Southwest Sewage Treatment Plant.

Much of this conduit is installed in long galleries where a turbulent stream runs under gratings, and is exposed to the most severely corrosive conditions existing in this type of installation. Hydrogen-sulfide and sulphur-dioxide are present in the atmosphere and the humidity approaches the saturation point most of the time.

*Reg. U. S. Pat. Off.

Ideal for sewage plant equipment, Everdur, The American Brass Company's copper-silicon alloy, combines strength, high resistance to corrosion with ready machinability and weldability. It is available in practically all commercial shapes. For detailed information on Everdur Metal write for Publication E-11.

44131

THE AMERICAN BRASS COMPANY

Subsidiary of Anaconda Copper Mining Company

General Offices: Waterbury 88, Connecticut

In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

Air view of world's largest sewage plant, Chicago, Ill.

EVERDUR METAL

is used in sewage works for Coarse and Fine Screens, Swing Gates, Built-up Sluice Gates, Coarse Bar Rack Aprons, Effluent Weirs and Scum Weirs, Structural Scum Baffle Brackets, Troughs, Screen Hoppers, Orifices, Baskets, Anchors, Ladders, Float Gage Chains, Valve Springs, Manhole Steps, Guides, Walkways, Bars and Plates, Bolts and Nuts.

Made by The American Brass Company

SAVE *time, money, headaches*

by using LATEST 1944 MODEL

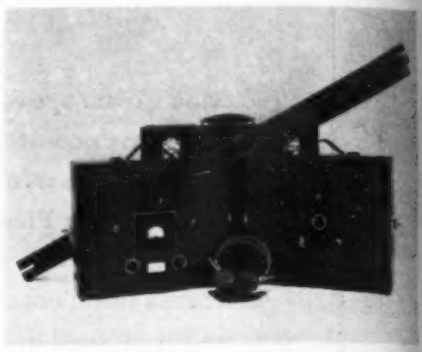
FISHER M-SCOPE INSTRUMENTS

The Fisher M-Scope Pipe Finder is successfully solving the varied problems involved in the development, operation and maintenance of buried pipe and cable systems.

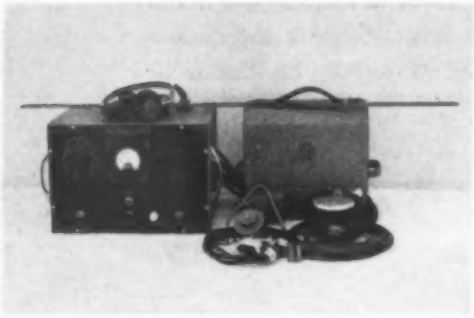
M-SCOPE PIPE FINDER

M-SCOPE LEAK DETECTOR

- It locates the exact position of the object
- It traces the exact course of an underground line
- It determines the difference between a buried pipe and a single metal object
- It works positively and instantaneously
- It prevents accidental damage by diggers
- It eliminates exploratory excavations
- It saves time, labor, money



M-SCOPE ENERGIZER TYPE PIPE LOCATER



Use the Fisher M-Scope Water Leak Detector to determine the exact location of a leak. Its use will enable you to

- Locate exact position of pipe line leak
- Determine where to break pavement when leak appears on the surface
- Solve the problem of "unaccounted for" water or oil
- Reduce operating expenses
- Increase net revenue
- Every leak is an unmetered user

THE FISHER M-SCOPE BOX LOCATOR

will locate valves, covered manholes, drip and service boxes, etc., as fast as you can cover the ground at walking speed. Do away with the old and slow dip-needle method. Liberal trade-in allowance on your old dip-needle.

Write to the Fisher Research Laboratory for latest 16-page booklet explaining the above methods. M-Scope Equipment is exclusively manufactured by the Fisher Research Laboratory. Please place your order now for immediate delivery from our Palo Alto, California or Chicago, Illinois warehouses.

FISHER
RESEARCH LABORATORY

1961-63-65 University Ave. Palo Alto, Calif.

Telephone PALO ALTO 24646-7-8-9

This 1,000,000-gal. HORTON ELEVATED TANK helps water works system to meet wartime emergencies

One only has to look at municipalities fortunate enough to have an elevated tank to see how this type of water storage is able to meet the emergencies that descend upon a city during wartime. Beaumont, Texas, erected this 1,000,000-gal. Horton radial-cone bottom tank in 1942 . . . a peacetime planned improvement to its water supply system that takes today's emergencies in stride.

Population served by the water system has increased between 40% and 45% and the average daily consumption of water has jumped from 5,500,000 gals. during the summer months to 8,000,000 gals. The water supply system serves many war production plants including two shipyards, one of which uses 700,000 to 800.000 gals. of treated water per day, and a large refinery. In spite of these emergencies, Beaumont's water works system continues to provide satisfactory service, uniform distribution pressures and adequate fire protection for its residents.

There are 99 miles of water mains throughout the system ranging in size from 6 inches to 24 inches. Total elevated storage capacity is 1,500,000 gals. and reservoir capacity is 5,000,000 gals.

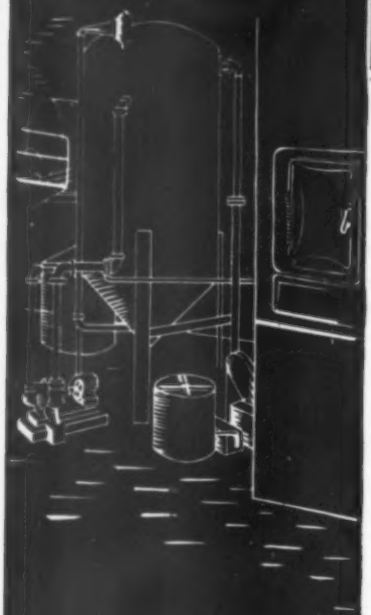
When planning postwar water supply systems consider Horton elevated tanks . . . write for complete information and quotations.

CHICAGO BRIDGE & IRON COMPANY

Chicago 4.....2198 McCormick Bldg.
New York 6.....3390-165 Broadway Bldg.
Cleveland 15.....2262 Guildhall Bldg.
Havana.....402 Edificio Abreu
Birmingham 1.....1586 North 50th Street
Plants in Birmingham, Chicago and Greenville, Pennsylvania

Tulsa 3.....1646 Hunt Bldg.
Houston 1.....5615 Clinton Drive
Philadelphia 3.....1644-1700 Walnut Bldg.
Washington 5.....330 Bowen Bldg.
San Francisco 5.....1083 Rialto Bldg.
In Canada: Horton Steel Works, Limited., Fort Erie, Ont.

Let this man



. . . meet with your Postwar planning board

● He's an expert on municipal water conditioning . . . he has worked with hundreds of city engineers, consulting engineers, and planning committees . . . time and again his impartial advice and friendly assistance have been of real value in solving many municipal water conditioning problems. He's a Graver engineer . . . and his services are available to you without charge or obligation.

Postwar planning now calls for action. It's time to get those ideas on paper...to start the engineering and designing . . . to get estimates on the cost. All of that work can, and should be done now. Then, when the last shot has been fired and Victory is ours, there need be no delay in getting your equipment into production.

Tell us the nature of your project. There's a Graver engineer ready to help you . . . without obligation.

GRAVER

WATER CONDITIONING EQUIPMENT

Process Equipment Division of

GRAVER TANK & MFG. CO., INC.

4809-43 Tod Ave., East Chicago, Ind.

NEW YORK CATASAUQUA, PA. CHICAGO TULSA

Graver designs, builds, and installs water conditioning equipment of all types—Hot Process Water Softeners—Zeolite Water Softeners—Water Filters—Iron Removal Filters—Taste and Odor Removal Filters — Reactivators — Swimming Pool Equipment.

The Mystery is Solved!

—USE AQUA NUCHAR ACTIVATED CARBON

April showers will bring forth more than mere flowers for the Water Works Official. April and May bring not only high turbidities but also a variety of objectionable tastes and odors due to the washing out of stagnant and swampy areas on the water shed.

Be prepared to handle this situation with an adequate supply of Aqua Nuchar Activated Carbon to control such tastes and odors which reach your intakes. Aqua Nuchar Activated Carbon is accepted as the most effective means of eleminating tastes and odors from water supplies.

Stocks of Aqua Nuchar are available throughout the country for immediate delivery and the service of our technical staff is at your disposal to aid you in taste and odor problems.

BLUEPRINT NOW!

But above all, remember there is a war yet to be won. Maintain equipment to assure operation at 100% efficiency.

NUCHAR

INDUSTRIAL CHEMICAL SALES

DIVISION WEST VIRGINIA PULP & PAPER COMPANY

230 PARK AVENUE, NEW YORK 17, N.Y. — 35 E. WACKER DRIVE, CHICAGO 1, ILLINOIS — 748 PUBLIC LEDGER BLDG., PHILADELPHIA 6, PA. — 844 LEADER BLDG., CLEVELAND 14, OHIO

Oh How They HAVE To Get Up In The Morning

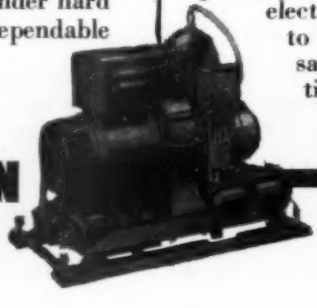
Bombers never sleep late. No sir! It's up at the crack of dawn . . . up for a crack at the enemy. And during the warming up period, when bombers get their "shave and shower," you hear the steady hum of the good old "putt-putts" . . . the Homelite Portable Generators that pour out juice for charging batteries and testing electrical equipment on those giant fighting birds.

And don't forget this . . . ground crews, the men who groom the planes, demand top-notch performance and reliability. Failures drive them nuts. And the specifications handed down for the equipment they use are a challenge to manufacturers.

Yet, here at Homelite, we're making gasoline-engine-driven generators that meet these needs . . . so light-weight, they can be carried in the plane . . . so compact, they can be moved anywhere at the base. Strong, durable generators that stand up under hard usage. Powerful ones, that generate plenty of current. Dependable Homelites, that operate in any climate.

Oh how they'll HAVE to get out at night

After the war, Homelites will be back on the old stand . . . making many new friends . . . by furnishing power for brilliant floodlights and electric tools, so necessary to speed work and increase safety on night construction and emergency repairs.

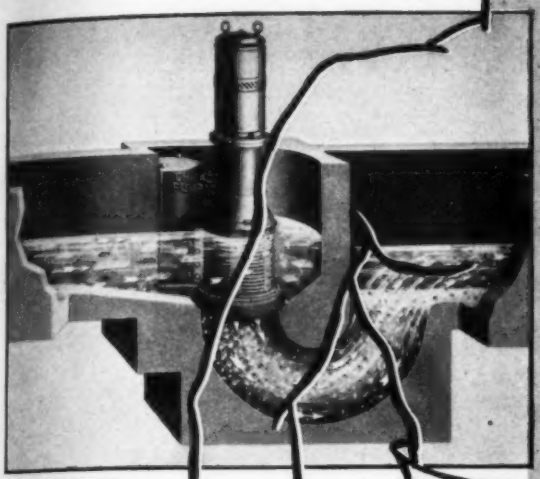


HOMELITE CORPORATION
PORT CHESTER, NEW YORK

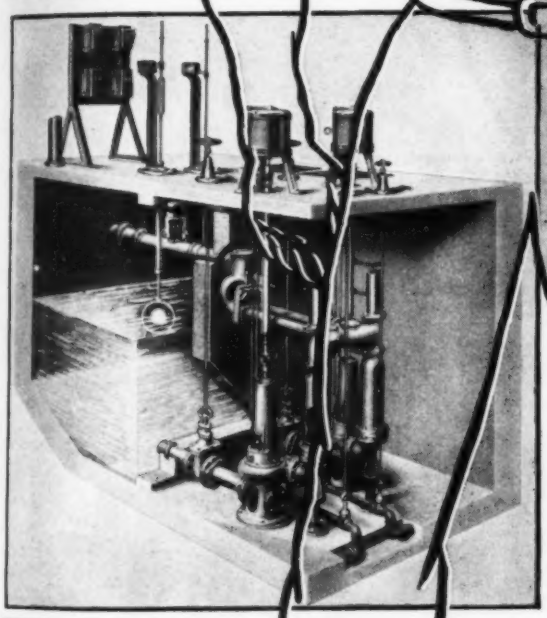
MANPOWER

. . . . . NO PROBLEM

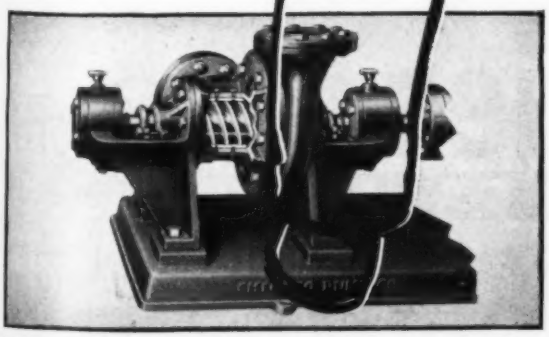
WHERE COMMINUTORS, FLUSH-KLEENS AND SCRU-PELLERS ARE INSTALLED



COMMINUTOR



FLUSH-KLEEN



SCRU-PELLER

Automatic, trouble-free handling of sewage . . . Eliminating most common and usual troubles in sewage plants and lift stations.

COMMINUTORS provide subsurface, automatic screening and cutting of coarse sewage solids without removal from channel . . . Save manpower required for raking screens and hauling, burial, incineration or feeding screenings to a grinding mechanism . . . Eliminate use of truck for hauling screenings. Save tires and gasoline . . . Remove health menace from handling screenings . . . Reduce clogging of pumps and piping and the resulting manpower required to clear them . . . Reduce maintenance requirements on pumps by cutting up the large solids that would throw pump impellers and shafts off balance and cause the pumps to wear rapidly . . . Manual attention required only for periodic inspection, cutter sharpening and lubrication.

FLUSH-KLEENS provide automatic trouble-free sewage lift station service. They cannot clog, because solids do not pass through the impellers . . . No labor required for disassembling and cleaning, as with other types of sewage pumps . . . Maintenance consists only of lubrication.

SCRU-PELLERS cut as they pump primary sludge or raw sewage with a large percentage of solids . . . Clog-proof service reduces labor required for disassembling and cleaning other types of primary sludge pumps.

CHICAGO PUMP COMPANY

SEWAGE EQUIPMENT DIVISION

2300 WOLFRAM STREET — CHICAGO 18, ILLINOIS

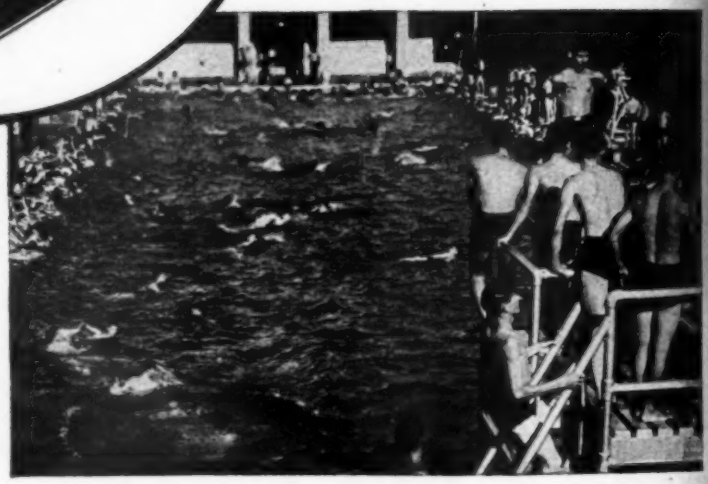
Electric [illegible] Circulating, Bilge, Scru-Peller, Flush-Kleen, Plunger, Fire, House, Condensation, Vacuum.

Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Comminutors.

In mobile water purification units that follow the ebb and flow of battle—at training stations and camps throughout the world . . . Mathieson Sanitation HTH safeguards our fighting men from the deadily scourge of disease. This quick-acting dry chlorine bactericide purifies drinking water and renders the disposal of sewage safe and sanitary.

AGAINST THE

SCOURGE OF DISEASE



AVAILABLE FOR THE HOME FRONT, TOO

For water works use, swimming pool sanitation and other essential water treatment needs, there is sufficient Sanitation HTH to meet your requirements. Supplied in cases of nine 5-lb. cans and in 100-lb. drums. Write for complete data.

Mathieson
CHEMICALS

THE MATHIESON ALKALI WORKS (INC.) 60 EAST 42nd STREET, NEW YORK 17, N. Y.

SANITATION HTH . . LIQUID CHLORINE . . PH-PLUS . . FUSED ALKALI . . CAUSTIC SODA . . SODA ASH . . BICARBONATE OF SODA . . BLEACHING POWDER
AMMONIA, ANHYDROUS & AQUA . . DRY ICE . . CARBONIC GAS . . SYNTHETIC SALT CAKE . . SODIUM CHLORITE PRODUCTS . . SODIUM METHYLATE

QUICK FACTS ON TRANSITE SEWER PIPE

FAST INSTALLATION . . . Transite's long lengths reduce the number of joints needed in the line . . . its light weight permits easier, faster, more economical handling.

LESS INFILTRATION . . . Fewer, tighter joints minimize leakage, cutting down on the load at the disposal plant.

HIGH DELIVERY CAPACITY . . . This advantage of Transite Pipe frequently permits smaller pipe or flatter grades, resulting in shallower trenches.

AVAILABLE BOTH FOR FORCE MAINS AND GRAVITY LINES . . . Complete information is given in brochure TR-21A. And for details on lower-cost water transportation, send for Transite Water Pipe Brochure TR-11A. Johns-Manville, 22 East 40th Street, New York, N. Y.

ENGINEERING DATA

GRAVITY TYPE

Sizes: Class 1— 4" to 36"
Class 2—10" to 36"
Class 3—10" to 36"
Class 4—18" to 36"

Crushing Strengths:
A.S.T.M. 3-edge bearing test method

Pipe size inches	Lb. per linear ft.			
	Class 1	Class 2	Class 3	Class 4
4	4125	....	....	....
5	3350	....	....	....
6	2880	....	....	....
8	3100	....	....	....
10	2580	....	....	....
12	2370	3690	4920	....
14	2200	3850	5100	....
16	2120	3920	5150	....
18	2030	4050	5280	....
20	2290	4140	5360	....
24	2340	4280	5850	6340
30	2980	4550	7050	7100
36	3500	5000	8180	8600
		5400	9700	10450
				12300

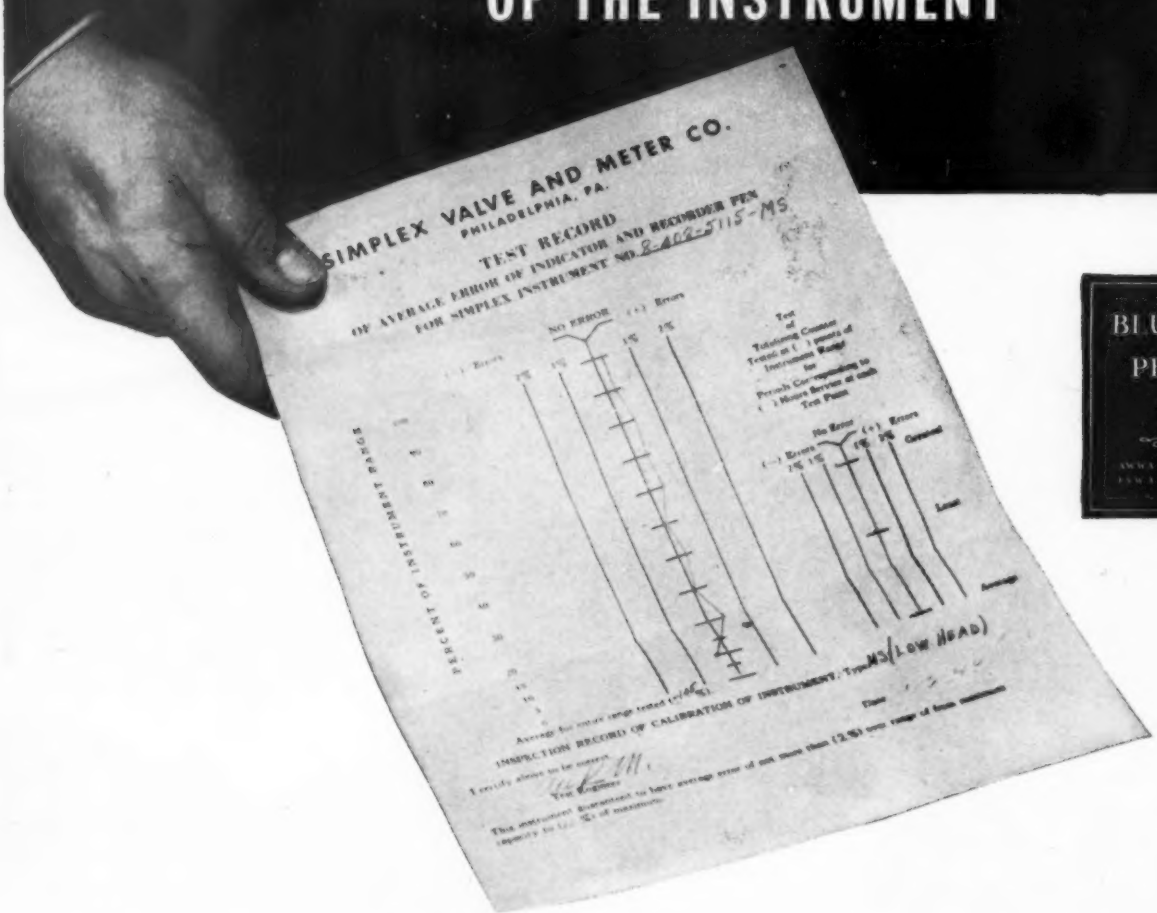
Friction Coefficient (Kutter's); n=.010

PRESSURE TYPE

Sizes: 3" to 36"
Pressure classes: Class 50— 50 lbs. per sq. in.
Class 100—100 lbs. per sq. in.
Class 150—150 lbs. per sq. in.
Class 200—200 lbs. per sq. in.
Friction Coefficient (Williams & Hazen): C = 140

Johns-Manville
TRANSITE SEWER PIPE
An Asbestos Product

Every SIMPLEX FLOW RATE METER IS TESTED OVER THE ENTIRE RANGE OF THE INSTRUMENT


SIMPLEX VALVE AND METER CO.
PHILADELPHIA, PA.
TEST RECORD
OF AVERAGE ERROR OF INDICATOR AND RECORDER PEN
FOR SIMPLEX INSTRUMENT NO. 8-462-5115-MS
NO ERROR
PERCENT OF INSTRUMENT RANGE
INSPECTION RECORD OF CALIBRATION OF INSTRUMENT. Type MS (LOW HEAD)
Date

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ARMY E NAVY

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•

DESIGNED FOR TROUBLE-FREE OPERATION

•

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Where a high degree of treatment is required, with minimum initial outlay and maintenance cost. CARTER Improved Automatic Alternating Siphons will deliver the service you're after.

This typically efficient CARTER Equipment offers an economical method of secondary treatment which has consistently proved equal to, and in many cases superior to other treatment methods, regardless of cost.

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ECLIPSE AVIATION DIVISION
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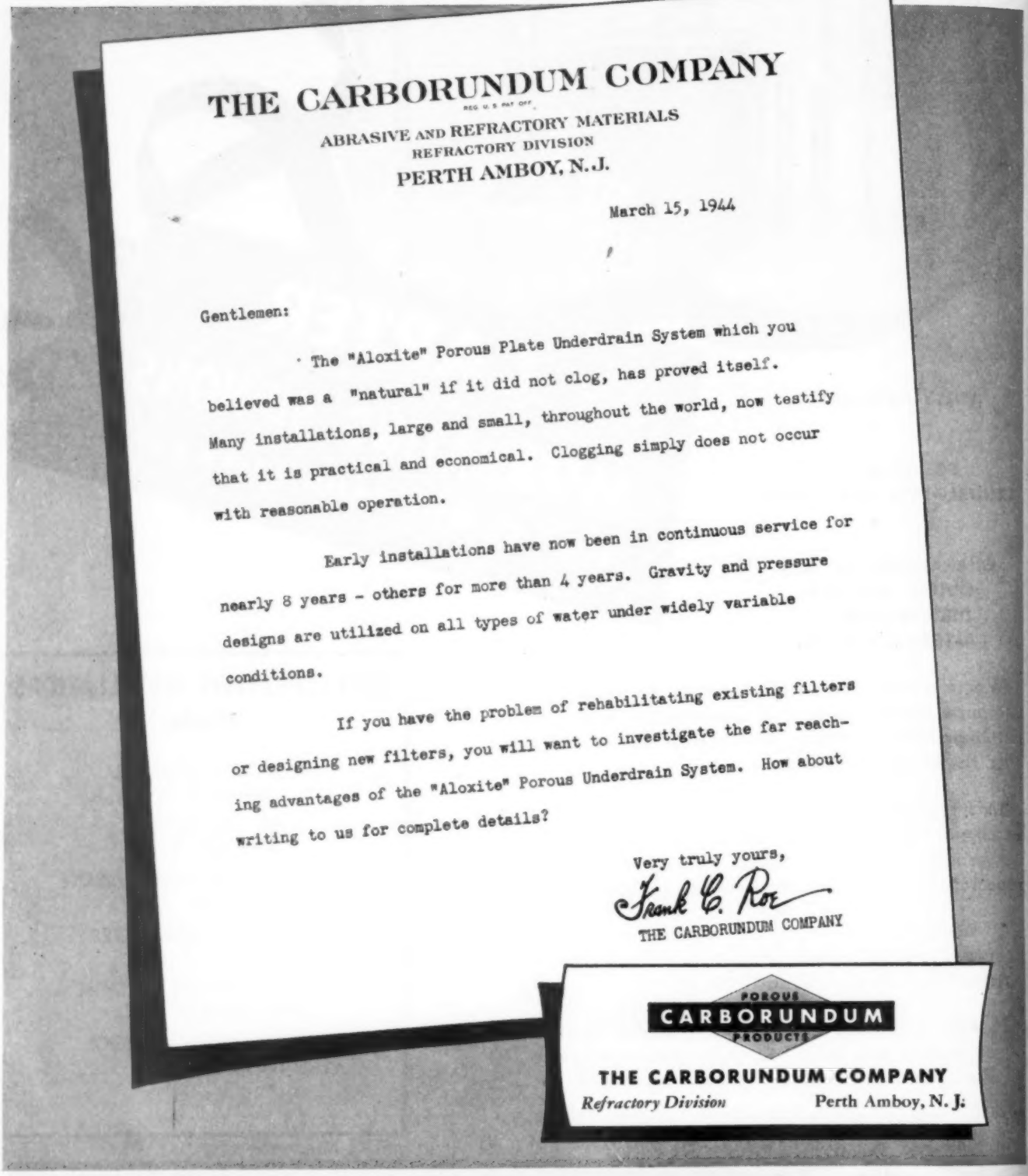
RALPH B. CARTER COMPANY

Main Office
HACKENSACK, N. J.

New York Office
53 Park Place, NEW YORK 7

An open letter about Porous Underdrain Systems to Engineers and Water Superintendents



THE CARBORUNDUM COMPANY
REG. U. S. PAT. OFF.
ABRASIVE AND REFRACTORY MATERIALS
REFRACTORY DIVISION
PERTH AMBOY, N. J.

March 15, 1944

Gentlemen:

The "Aloxite" Porous Plate Underdrain System which you believed was a "natural" if it did not clog, has proved itself. Many installations, large and small, throughout the world, now testify that it is practical and economical. Clogging simply does not occur with reasonable operation.

Early installations have now been in continuous service for nearly 8 years - others for more than 4 years. Gravity and pressure designs are utilized on all types of water under widely variable conditions.

If you have the problem of rehabilitating existing filters or designing new filters, you will want to investigate the far reaching advantages of the "Aloxite" Porous Underdrain System. How about writing to us for complete details?

Very truly yours,
Frank C. Roe
THE CARBORUNDUM COMPANY

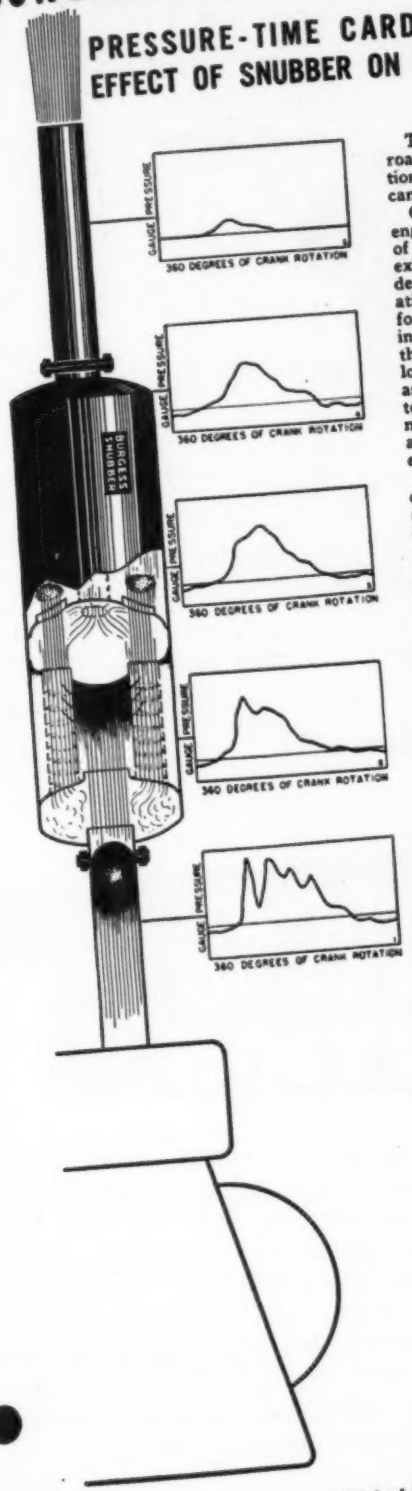
POROUS CARBORUNDUM PRODUCTS
THE CARBORUNDUM COMPANY
Refractory Division Perth Amboy, N. J.

Porous Products by CARBORUNDUM TRADE MARK

(Carborundum and Aloxite are registered trade marks of and indicate manufacture by The Carborundum Company)

BURGESS SNUBBER BULLETIN for Diesel Exhaust Noise Control

PRESSURE-TIME CARDS SHOW SMOOTHING EFFECT OF SNUBBER ON DIESEL EXHAUST SLUGS



The source of Diesel engine exhaust roar must be understood before the action of a Snubber in preventing the noise can be appreciated.

One of the characteristics of Diesel engine exhaust is its widely varying range of pressure. With the opening of the exhaust port or valve, burned gas suddenly expands into the exhaust pipes creating a condition similar to an explosion forcing a slug of gas along the pipe, drawing a negative pressure in the end where the disturbance occurred. This is followed by an oscillation of gas in the pipe as it flows back and forth in an attempt to establish equilibrium. Just before the next exhaust impulse, approximately atmospheric pressure prevails at the engine end of the pipe.

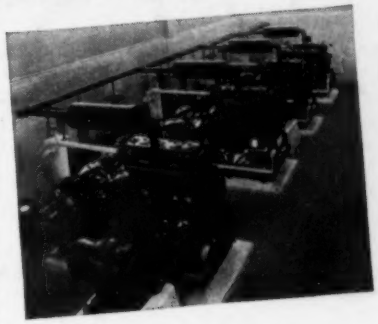
The roar of the free Diesel exhaust is caused by unrestrained expansion of these slugs of gas as each is released from the engine under relatively high pressure.

By slowing down the high-speed slugs in a Snubber before they reach the atmosphere the noise is prevented. The slug enters the first section of the Snubber where it expands and loses much of its energy as it passes into the second section. This is a typical snubbing action with the slugs being expanded and their energy dissipated. Each of the other two successive snubbing sections further slow down and dissipate the slug's energy so they reach the atmosphere in a quiet flow, without noisy impact.

The five pressure-time cards shown here were made from practically instantaneous pressure readings obtained over the entire engine cycle with a Sampling Manometer at each of the positions indicated on the Snubber. These readings were taken on a single cylinder Diesel engine firing twenty times per second.

As the slug travels through the Snubber the high initial pressure peak is gradually smoothed down, each section of the Snubber contributing to the process.

The curve in Figure 1, shows that the exhaust is surging back and forth in the exhaust pipe before the Snubber has a chance to break up the slug. The other curves show, that after passing through the first section of the Snubber, there is no negative pressure and that the exhaust gas flows in one direction only. With the flow of gas substantially in one direction, the exhaust system, for practical purposes, ceases to act as an acoustic system.

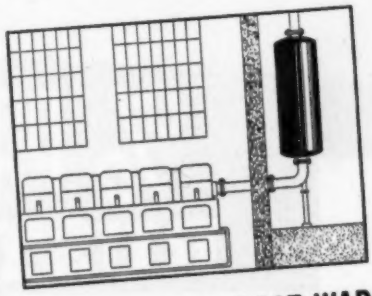


NEW LONDON, CONN., PUMPING STATION

The recently completed pumping station for the city of New London, Connecticut, is powered with four Murphy Diesel engines each with a maximum governed speed of 1200 rpm and 85 hp continuous rating. Each engine is equipped with its own Burgess Snubber and exhaust line, which discharges into a dry-well with free vent to the top of the building.

The Burgess Exhaust Snubbers prevent annoying exhaust noise by dissipating the energy of the fast moving slugs of exhaust gas, thereby preventing the condition that causes noise at the tail pipe. The resulting smoother gas flow in the tail pipe prevents the system from resonating —the cause of exhaust pipe roar.

Snubbers are widely used by waterworks and sewage treatment plants as well as on industrial and marine Diesel engines, because they eliminate exhaust noise without impairing engine performance.



PLANNING FOR POST-WAR POWER PLANTS

Burgess Snubbers can be mounted in any position and will operate with equal efficiency whether they are close to or far away from the engine but there are certain methods of mounting them which are simpler and easier to construct. The method illustrated here is the ideal way to install snubbers for exhaust pipes up to eight inches in diameter. A standard base elbow makes it possible to use the exact length of supporting pipe so that the exhaust pipe can be carried straight out from the manifold to the Snubber inlet.

BURGESS BATTERY COMPANY

announces

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BURGESS-MANNING COMPANY

2015 W. BOSCOB STREET, CHICAGO 12, ILLINOIS

This involves no change in personnel or policy

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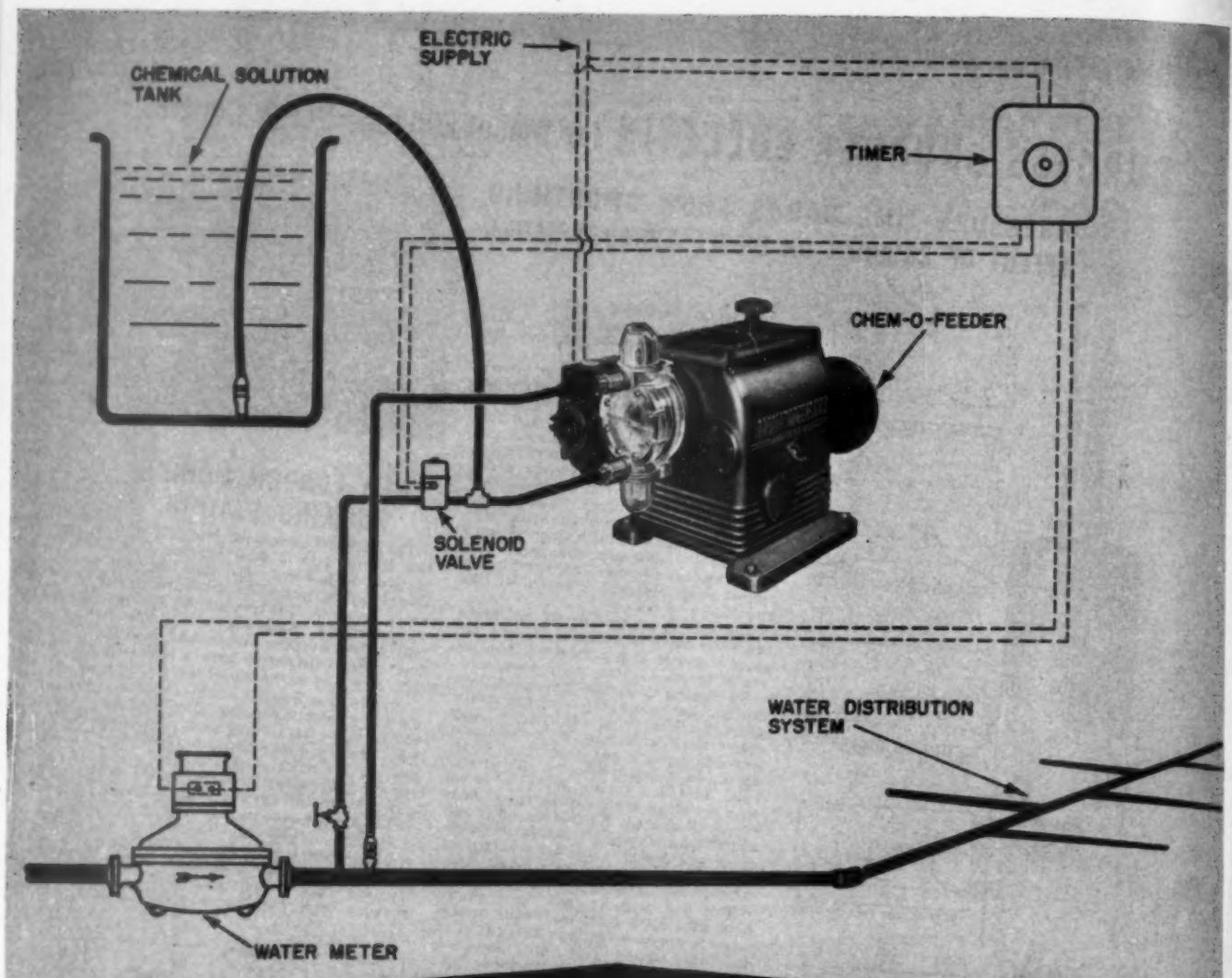

%PROPORTIONEERS%
RUST PREVENTION

Don't let corrosion sabotage pipes, valves or tanks! Scarcity of materials and labor today make rust prevention of particularly vital importance. When you are protecting the distribution system—the major portion of every water company's investment—it is not "smart gambling" even in ordinary times to take chances on under or over dosage of corrosion control chemical. With %Proportioneers% Heavy Duty Chem-O-Feeder as shown above there is no gamble on over or under dosage. The Chem-O-Feeder operates continuously but feeds only in proportion to flow through the water meter. By this method silicates, phosphates, etc., can be accurately fed directly into the pressure system. %Proportioneers% of different pressure or delivery capacity are available for this or other layouts. For immediate attention send details of your corrosion control problem to %Proportioneers, Inc.%

%PROPORTIONEERS, INC.%

"Chemical Feeder Headquarters"

9N CODDING ST., PROVIDENCE, R. I.

WATER WORKS & SEWERAGE

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E. S. Gillette, Publisher

EDITORIAL OFFICE
155 East 44th Street, New York, N. Y.
L. H. Enslow, Editor

COMING!

"Standards for Water Service"

Is the story of methods, developed in Richmond, Va., and the establishment of certain "standards" for water service which has involved careful forethought, study and trial prior to adoption as "official standards" by the Common Council. Involved are "Pressure Standards"; "Permissible Sizes of Service Lines and Meters"; "Basis for Installation Charges for Service Lines and Meters." These last two "standards" will be of especial interest to every water utility manager. This meaty contribution comes from a name already well known for innovations and economy measures—

MARSDEN SMITH, Chief Engineer,
Dep't of Public Utilities, Richmond, Va.

"Accounted-For Water and Unbilled Revenue"

Describes a highly useful method for estimating, within reasonable accuracy, the quantity of water which has been registered through consumers' meters, on the whole or any section of the distribution system, at any time between reading of the meters. Such a scheme may be used for estimating accounted for water at any time desired between meter readings. In addition, in these days of rendering estimated interim bills between skip month meter readings the scheme has a timely additional use in rendering such estimated bills.

"The Sludge Index in Plant Operation Control"

Is an article which reveals how the "Sludge Index" can be applied in routine control of activated sludge plant operation. The author, with many years of operating experience at Milwaukee and Indianapolis, offers some new slants on how the "Sludge Index" may serve as an operating guide in adjusting sludge return rates, sludge concentration in the mixed liquor (aerators) and in the final clarifiers. This article comes from—

DON E. BLOODGOOD,
Former Supt. at Indianapolis and now Assoc. Professor of Sanitary Engineering, Purdue Univ.

"Sewers"

Is a review of those things which all of us are supposed to know are important considerations in sewer design and construction but, from conditions observed by the author, are too frequently overlooked or ignored. This review is something of a "refresher course" which is frequently very useful. The author points especially to those items which deserve more consideration in the present day of sewage treatment that was not a problem in the earlier days of sewer construction. The author is—

CARROLL H. COBERLY,
Consulting Engineer, Denver, Colo.

Cleaning a Water Main with Compressed Air

Is a brief story telling of the usefulness of compressed air injected into a long force main, while pumping at maximum rate, as a means of breaking loose and flushing out a form of encrustation which gradually builds up to markedly reduce the main capacity and increase pumping costs. The article explains how simple and fool-proof this effective remedy is. The same article also reveals the effectiveness and economy of well desanding with compressed air. This story comes from—

ROSCOE R. HOWARD,
Supt. of Utilities, Slater, Mo.

"Helpful Gadgets for a Sewage Treatment Plant"

Are being described by the inventor of the "Electromagnetic Pipe Locator" described in an earlier issue. He is—

BASIL MILLER, Supt.,
Public Utilities, Fennimore, Wis.

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Demonstrating the Value of *A Sensitive Accurate Meter....*

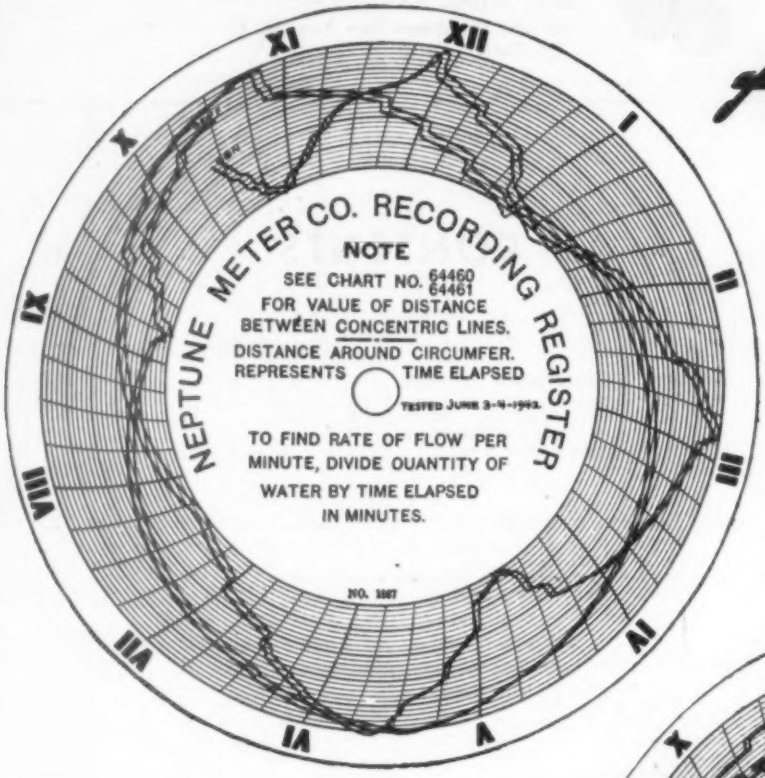
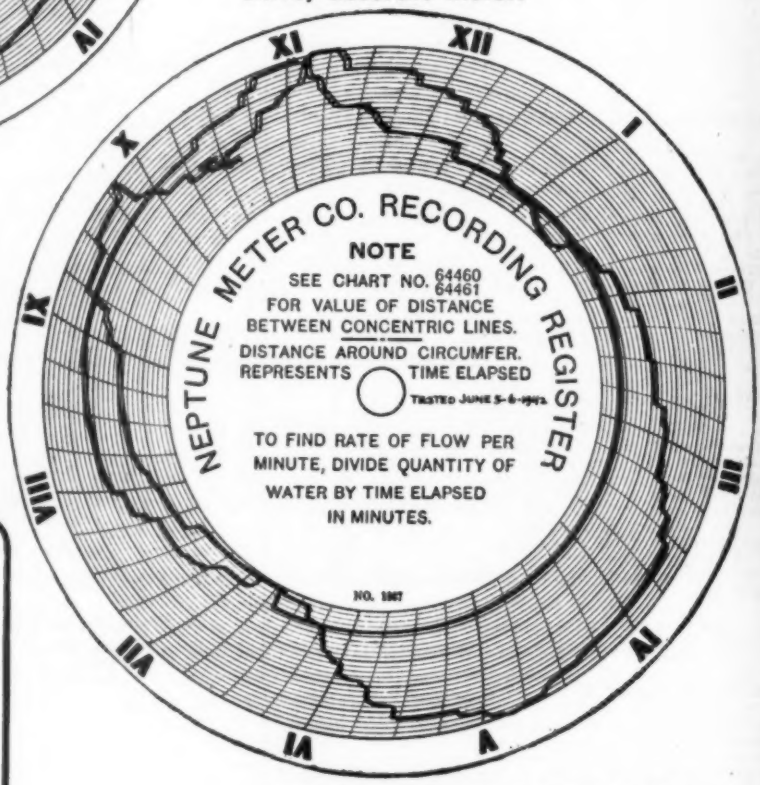

NEPTUNE METER CO. RECORDING REGISTER
NOTE
SEE CHART NO. 64460 64461
FOR VALUE OF DISTANCE
BETWEEN CONCENTRIC LINES.
DISTANCE AROUND CIRCUMFER.
REPRESENTS TIME ELAPSED
TESTED JUNE 3-4-1942.
TO FIND RATE OF FLOW PER
MINUTE, DIVIDE QUANTITY OF
WATER BY TIME ELAPSED
IN MINUTES.
NO. 1887
XI XII I II III IV A IIA VIII VIIIA IX X

Chart at left is an actual record taken from a house with a toilet leak of about 1/10th gallon per minute, as registered by a sensitive, accurate meter.

CONSUMPTION 55.1 CU. FT.

Chart at right shows the result in the same house after this leak had been repaired—a drop in consumption, for a 24-hour period, of 149 gallons.


NEPTUNE METER CO. RECORDING REGISTER
NOTE
SEE CHART NO. 64460 64461
FOR VALUE OF DISTANCE
BETWEEN CONCENTRIC LINES.
DISTANCE AROUND CIRCUMFER.
REPRESENTS TIME ELAPSED
TESTED JUNE 5-6-1942.
TO FIND RATE OF FLOW PER
MINUTE, DIVIDE QUANTITY OF
WATER BY TIME ELAPSED
IN MINUTES.
NO. 1887
XI XII I II III IV A IIA VIII VIIIA IX X

CONSUMPTION 35.5 CU. FT.

THIS comparison clearly demonstrates the value of a sensitive, accurate meter, as a meter which would not register at this low rate of flow would never have picked up the leak.

The Water Company would have lost the revenue on approximately 149 gallons per day or about 13,500 gallons per quarter.

Instead of 1/10th gallon per minute, leakage might have run as high as 1/3rd gallon per minute, with that much more loss to the Water Company.

NEPTUNE METER COMPANY

50 West 50th Street

New York 20, N. Y.

Branch Offices in CHICAGO, SAN FRANCISCO, LOS ANGELES, PORTLAND, ORE., DENVER, DALLAS, KANSAS CITY, LOUISVILLE, ATLANTA, BOSTON.

Neptune Meters, Ltd., Long Branch, Ont., Canada

WATER WORKS & SEWERAGE

VOL. 91, No. 4 *A Gillette Publication* APRIL, 1944

A PLANNED MAINTENANCE SYSTEM

Developed and Time-Tested by the St. Louis County Water Co.

By VANCE C. LISCHER and HERBERT O. HARTUNG
Production Engineer Sanitary Engineer
ST. LOUIS COUNTY WATER CO.
UNIVERSITY CITY, MO.

PLANNED maintenance when properly systematised will provide answers to such questions as the following:

1. When was the No. 1 Coagulant Feeder last overhauled?

2. When should the River Power Line oil circuit breaker be next inspected?

3. What is the ring clearance, the bearing clearances, the end play, etc., in No. 1 Booster Station Pump?

Directories and Card Files of the Planned Maintenance System

4. What materials were used in the rehabilitation of the worn parts in the No. 2 High Service Pump?

5. How much did the last overhauling of the Clarifier Basins cost?

6. Will the shop force be too busy next month to build a pipe derrick that the construction crew needs?

7. What work should be done at the same time that the clear wells are next emptied?

8. How will the maintenance man find out that the thrustor motors require a special heat resistant bearing grease when he services them?

The ready answers to such and similar questions are very necessary in intelligent and economical plant management and operation. The ability to maintain uninterrupted utility service, and the capacity to direct utility operations properly is dependent upon having this kind of information continuously available.

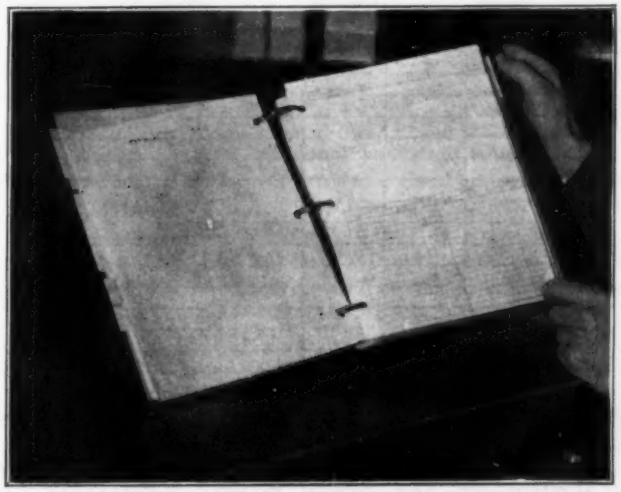
Since the answers to such questions are of such importance, it is, obviously, unwise to retain them in the private notes or memories of a superintendent, a maintenance supervisor or a master mechanic. Such practice would be comparable to retaining distribution system records in the same way. Instead, a carefully detailed system of records, written maintenance procedures and maintenance schedules are necessary. The Planned Maintenance System described herein provides the answers to all of the questions raised and to many more.

This Planned Maintenance System could also be called a system of scheduled maintenance, or a program of systematized preventative maintenance. In short it represents a system developed to insure practices in which the well known "stitch in time saves nine." It means frequent inspections, proper lubrication, and the prompt restoration or repair of worn parts which might affect operations. It means fixing things before they break and not afterwards. However, in addition, it means that such inspections, lubrications and repairs are done according to a pre-arranged plan and a written schedule.

This plan is based on a thorough analysis of each individual machine, the manufacturer's recommendations as to its care and use and the past experience with it in the plant. Further the plan coordinates utility operation and maintenance. It requires accurate records and a practical workable system.

The System

The Planned Maintenance System presented herein



A Property Maintenance Directory

consists of three essential instruments. These are:

(1) A Property Maintenance Directory.

(2) A Calendar Maintenance Directory.

(3) Job Requisitions.

These three instruments are the logical and yet simple means necessary to accomplish the already inferred objectives of a properly Planned Maintenance program.

The Property Maintenance Directory (of equipment) is a loose leaf compilation of inspection, lubrication and service schedules planned for each equipment item in the plant. The Calendar Maintenance Directory (of scheduled services) is a loose leaf compilation of timed inspection, lubrication and service schedules planned for completion in various calendar periods of weeks or months. The Job Requisition is the work order given to the maintenance man when work is due, and the form upon which he writes his job report.

The Property Maintenance Directory

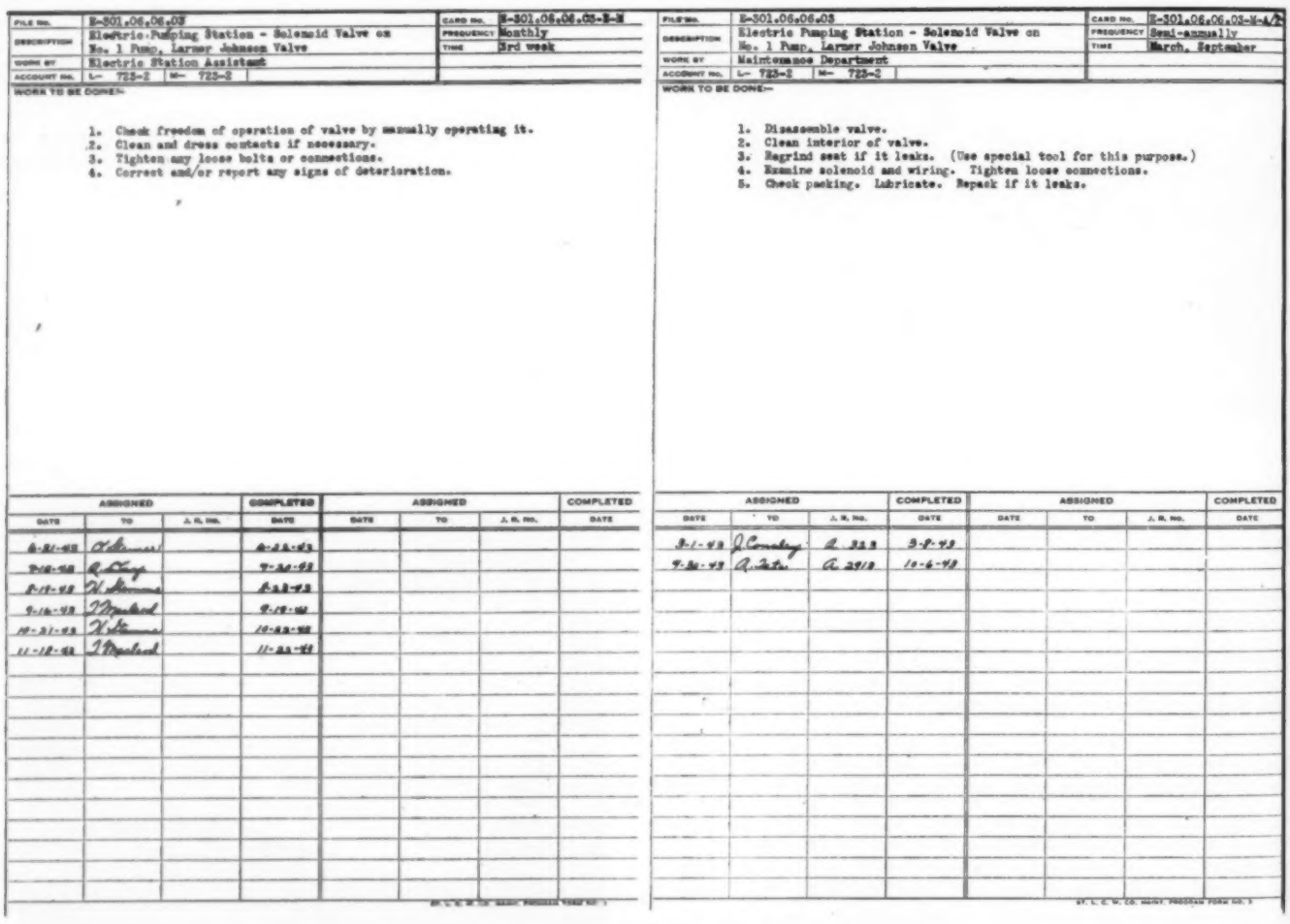
The Property Maintenance Directory answers the general questions, "What maintenance and service has been planned for this or that equipment? What is the frequency of such maintenance and when is it scheduled?" It also lists a "service record," consisting of service or inspection dates, references to inspection reports and the name of the person having done the work.

The Property Maintenance Directory is simply a loose leaf notebook in which the scheduled maintenance requirements of each item of equipment or property in the plant is listed. There is a separate page for all work scheduled for the same frequency. More specifically, each page is an instruction sheet of routine Planned Maintenance required by the particular equipment items either weekly, monthly, quarterly, etc. The order of arrangement of these pages in the directory is first accorded to equipment, using an identifying property number for proper sequence and convenient indexing; and then by scheduled frequency. Fig. 4 pictures typical pages of Property Index as they appear in the Property Maintenance Directory.

Obviously, for each equipment item in the plant, there are usually several pages in the Property Maintenance Directory, depending upon the number of inspections required. The weekly inspection is itemized upon one sheet, the monthly inspection is itemized on a second sheet, the quarterly inspection is itemized on a third sheet, and the annual inspection is itemized on a fourth sheet, etc.

As an example of the Property Maintenance Directory in use; the inspections required by a particular solenoid Valve may be found by turning to section E-301.06.06.03, its property number. (See Fig. 1). In this section are found two pages, each numbered E-301.06.06.03. The first page itemizes Planned Maintenance to be done monthly and the second page itemizes Planned Maintenance to be done semi-annually.

On the bottom of the page are the service records of this Planned Maintenance. The Job Requisition column on the page showing monthly work has no entries, indi-



FILE NO. E-301.06.06.03
DESCRIPTION Electric Pumping Station - Solenoid Valve on No. 1 Pump, Larner Johnson Valve
WORK BY Electric Station Assistant
ACCOUNT NO. L– 723-2 M– 723-2
CARD NO. E-301.06.06.03-M
FREQUENCY Monthly
TIME 3rd week

WORK TO BE DONE:–

1. Check freedom of operation of valve by manually operating it.
2. Clean and dress contacts if necessary.
3. Tighten any loose bolts or connections.
4. Correct and/or report any signs of deterioration.

ASSIGNED DATE	ASSIGNED TO	ASSIGNED J. O. NO.	COMPLETED DATE	ASSIGNED DATE	ASSIGNED TO	ASSIGNED J. O. NO.	COMPLETED DATE
8-21-43	Wilkinson		8-23-43				
9-18-43	R. Clay		9-20-43				
8-17-43	Wilkinson		8-23-43				
9-16-43	Copeland		9-18-43				
10-21-43	Wilkinson		10-23-43				
11-18-43	Copeland		11-20-43				

FILE NO. E-301.06.06.03
DESCRIPTION Electric Pumping Station - Solenoid Valve on No. 1 Pump, Larner Johnson Valve
WORK BY Maintenance Department
ACCOUNT NO. L– 723-2 M– 723-2
CARD NO. E-301.06.06.03-M-A/S
FREQUENCY Semi-annually
TIME March, September

WORK TO BE DONE:–

1. Disassemble valve.
2. Clean interior of valve.
3. Regrind seat if it leaks. (Use special tool for this purpose.)
4. Examine solenoid and wiring. Tighten loose connections.
5. Check packing. Lubricate. Repack if it leaks.

ASSIGNED DATE	ASSIGNED TO	ASSIGNED J. O. NO.	COMPLETED DATE	ASSIGNED DATE	ASSIGNED TO	ASSIGNED J. O. NO.	COMPLETED DATE
3-1-43	J Crowley	A 323	3-5-43				
9-24-43	A. Jetter	A 2919	10-6-43				

Fig. 1. Two Pages from the Property Maintenance Directory
Monthly and Semi-Annual Planned Maintenance Loose-Leaf Inserts for a Solenoid Valve Identified by Property Index Number E-301.06.06.03. The pages are 8½"x11".

cating that no reports were necessary other than signatures which show completion of the assigned work. The Job Requisition column (J.R.), on the page showing quarterly work, gives several reference numbers to job reports written on Job Requisition forms by the person who did the work. Job Requisitions are discussed in a later paragraph.

Similarly, the Planned Maintenance for any other property or equipment in the plant (regardless of whether it is an automobile or a laboratory centrifuge) can be found in this Property Maintenance Directory. Further, the month or week in which such work has been scheduled is also given with a simple record of past servicing or past maintenance.

Authors
Lischer and Hartung

The Property Maintenance Directory is perhaps analogous to a budget of expenditures. Both answer the general questions, "How much?" and "When?" The budget answers these questions with reference to dollar expenditures while the Property Maintenance Directory answers these questions in regard to s c h e d u l e d maintenance.

Property Numbers (see Fig. 4) are used as a means of arranging the loose leaf inspection sheets in the Property Maintenance Directory because it enables; first, the grouping of all related equipment (on the basis of usage) in one section. This is an advantage, inasmuch as it then becomes a much easier job to coordinate services and inspections which should be done in conjunction with each other. An alphabetical indexing would cause confusion when equipment is known by several names. For example, an alphabetical indexing would allow several positions in the Property Maintenance Directory for an item commonly called, Injector, Ejector, Eductor, Water Pump, Vacuum Pump, Syphon Jet, etc.

The writing of a Property Maintenance Directory is not the herculean task that it might appear to be. Of course an inventory of property requiring maintenance is necessary, in which related items (such as Coagulant Building Equipment) are grouped together. Then an identifying number (Property Number) is assigned to each inventory item for file purposes and future ready reference. From the inventory at hand, Planned Maintenance schedules and instructions are written for each item on inserts for the loose leaf binder using manufacturers' recommendations, past experiences and service conditions.

Since the Property Maintenance Directory is in loose leaf form and a separate page is used for each inspection, omissions in the inventory or errors in judgment can easily be rectified without marring the Directory. Further, the loose leaf form allows the initiation of Planned Maintenance on a limited scale, with additions as time permits and experience dictates.

The Calendar Maintenance Directory

The Calendar Maintenance Directory answers a second series of related questions, the answers to which are necessary in intelligent utility operation. It answers, "What inspections and servicing are scheduled in each calendar period of the year? How much maintenance has been planned in January? In February? In March? etc." More specifically it answers, "What is the Planned Maintenance for the current period?"

The Calendar Maintenance Directory is also, simply stated, a loose leaf notebook, differing from the Property Maintenance Directory in that the various sheets itemizing work to be done are grouped by months or weeks. The pages of the Calendar Maintenance Directory (Fig. 2) are copies of the pages in the Property Maintenance Directory (Fig. 1), with the "service record" on the bottom of the page omitted. The sequence of the pages in the Calendar Directory is first by calendar period in which the work is to be done, second by whom the work is to be done (operator, maintenance man, foreman) and then by property number.

FILE NO.	B-705.01.01	CARD NO.	B-705.01.01-M-A/2
DESCRIPTION	Floc Basins - Speed Reduction Gear Unit No. F. T. 788	FREQUENCY	Semi-annually
		TIME	April, October
WORK BY	Maintenance Department		
ACCOUNT NO.	L- 743-41 M- 743-41		

WORK TO BE DONE:-

1. Change oil in gear case of units if in service. Use 22 pints S.A.E. 40 in October and S.A.E. 50 in April.
2. Make certain oil indicator is working properly.
3. Inspect oil drain lines for leaks. Repair if necessary.

FILE NO.	B-705.01.01	CARD NO.	B-705.01.01-M-A
DESCRIPTION	Floc Basins - Speed Reduction Gear Unit No. F. T. 788	FREQUENCY	Annually
		TIME	April
WORK BY	Maintenance Department		
ACCOUNT NO.	L- 743-41 M- 743-41		

WORK TO BE DONE:-

1. Disassemble motor, clean and paint windings with insulating varnish.
2. Wash out bearings and repack.

Fig. 2. Upper Portions of Two Pages from the Calender Maintenance Directory

These are identical in size, form and contents to pages covering the same equipment units in the Property Maintenance Directory, except that the lower halves of these sheets do not carry the forms for the "Service Data." The semi-annual maintenance page (left) is duplicated so that it turns up in April and again in October in the Calendar Directory. The memo for those additional maintenance operations, scheduled once each year (right), also turns up with the semi-annual page in April. Monthly maintenance pages appear only in the Monthly Section and are not reported in the twelve month by month sections.

Obviously, there is a page in the Directory for each time a maintenance inspection is planned during the year. When maintenance is planned quarterly, say in January, April, July and October, the same page is repeated in each of these monthly sections of the Directory. Similarly, when maintenance is planned semi-annually, say in March and September, the same page is repeated in each of these two monthly sections, etc.

When an inspection is planned monthly, it is understood that a page describing this work belongs in each monthly section of the Calendar Maintenance Directory. However, in order to keep the Directory from becoming too bulky, a Section designated as "Monthly" is inserted in the Directory to precede the twelve sections of the months of the year. All monthly schedules are inserted in this "Monthly" section and then omitted from all of the twelve specific monthly sections. Similarly, weekly inspections are inserted in a "Weekly" section which precedes the "Monthly" section in the Directory.

As an example of the makeup of the Calendar Maintenance Directory: duplicate pages describing the work to be done and items to consider in the *semi-annual maintenance* of the Solenoid Valves previously discussed are found in the March and September sections. A page describing the routine for *monthly* maintenance of this same Solenoid Valve is found in the "Monthly" section of the Directory only. Through this arrangement only those equipment units which receive maintenance less frequently than monthly, or a different degree of maintenance annually, semi-annually or quarterly are carried in the month to month sections.

The compilation of the Calendar Maintenance Directory entails only a very little additional work over that required to compile the Property Maintenance Directory. When the original maintenance schedule is made out for the Property Maintenance Directory, "Ditto" copies are made for the Calendar Maintenance Directory. The number of copies to be made equals the number of times the sheet is required in the Calendar Maintenance Directory.

Reference to the Calendar Maintenance Directory enables an even distribution of routine maintenance work throughout the year. The total man-hours of work planned for any month can also be taken from a study of this Directory, thus assuring the requisite amount of man-power in advance. The Calendar Maintenance Directory allows planning ahead, thereby coordinating operation and other phases of plant management with the maintenance program. However, its most important function is as an instrument from which work assignments are made.

The Job Requisition

When scheduled maintenance becomes due, a means for assigning this work to the person or persons who are to do it, is necessary. This is the first function of the Job Requisition (Fig. 3). At the same time, it gives the mechanic the planned details of his assigned job which are recorded on the Directory page and constitutes an order for requisitioning material from the storehouse. The Job Requisition is also the form upon which the mechanic writes his Job Report for current and historical records. It provides a place for time entries by all of those engaged in the work and this data is used in preparing the payroll. The Job Requisition also contains on the rear other pertinent data for the study, review and evaluation of the job, so important if maintenance is to be continuously and progressively planned.

The Job Requisition thus answers a third group of questions, the answers to which are necessary in the fulfillment of a Planned Maintenance Program. It answers, for the maintenance man, "What is my job assignment?" Then when the job has been completed, it answers for the management, "What work was done?" "What were the results of the inspection?" "How long did the job take and how many man-hours were required?" "What materials were used?" "What was the cost of the work?"

In general terms, the Job Requisition is the bridge between the office-planned maintenance and the job. It is the bridge between the planned and the accomplished. It is the means by which maintenance can be continually

JOB REQUISITION A 2055

FILE UNDER L-102.01.02 South Laboratory Table Hood - Exhaust Blower
DATE Nov. 25, 1943
ISSUED TO Harry Steffen
ORDERED BY OS
AT REQUEST OF OS

CHARGE ACCOUNTS
LABOR 744-3
MATERIAL 744-8
EQUIPMENT TIME
TO BE COMPLETED By December 1, 1943

APPROVED BY ______ ENGINEER

ORDERS

1. Disassemble motor; clean and paint windings with G. E. insulating varnish.
2. Clean and oil bearings using regular bearing oil.
3. Disassemble blower; clean and paint with black acid resisting paint.
4. Clean blower bearings and grease with Shell bearing grease.
5. Clean piping and paint if necessary using black acid resisting paint.
6. Clean and inspect ventilator through ceiling and on roof. If necessary to repaint, use a hot asphalt or pitch.

WORK DONE--

Date	Description of Work and Report	Signed
11/24/43	No. 1 completed.	
11/24/43	No. 2 completed.	
	No. 3, 4, and 5. Disassembled blower and brought	
	into shop for cleaning and painting.	Harry Steffen
11/27/43	Continued to clean and paint fittings.	Ray
11/30/43	Cleaned and painted remaining fittings on	
	exhaust in Laboratory	Hepler
12/1/43	Reassembled blower and installed motor.	
	No. 6 Completed	
	Fabricated new metal band for holding	
	wire screen around vent top	
	Painting of ventilator through ceiling and	
	on roof not necessary.	Steffen

ST LOUIS COUNTY WATER CO
PRODUCTION DIVISION
FORM NO. P. 1-J

WORK COMPLETED 12/1 19 43
SIGNED Harry Steffen
CHECKED BY [illegible]
OVER

COST DATA JOB REQUISITION A 2055

LABOR -- ACCT. NO. 744-3

Date	Name	On	Off	Hrs	Rate	Cost	Clerk's O.K.
11/24/43	Harry Steffen	11:30	12:00	½			✓
11/24/43	Harry Steffen	12:30	3:00	2½			✓
[illegible]	Willis Ray	11:30	12:00	½			✓
[illegible]	Willis Ray	8:00	11:30	3½			✓
11/30/43	H. Hepler	9:00	12:00	3			✓
11/30/43	H. Hepler	12:30	4:30	4			✓
11/30/43	Harry Steffen	12:30	3:00	2½			✓
12/1/43	Harry Steffen	10:00	12:00	2			✓
12/1/43	Harry Steffen	12:30	4:30	4			✓

TOTAL LABOR COST

MATERIAL -- ACCT. NO. ______

Date	Quantity	Stock No	Description	Unit Cost	Cost	Clerk's O.K.
12/1/43	¼#	C12 No. [illegible]	⅛" x ½" Band Iron			✓
11/27/43	1 gal.	C11 No. [illegible]	Black Acid Resisting Paint			✓

TOTAL MATERIAL COST

EQUIPMENT TIME -- ACCT. NO. ______

Date	Equipment	Hrs	Unit Cost	Cost

TOTAL EQUIPMENT COST

COST SUMMARY

Item	Cost
Labor	
Material	
Equipment Time	
Total	

Fig. 3. Job Requisition Sheet Front (left) and Rear (right)

These 8½"x11" sheets carry the Job Assignment and Job Report Form on the front and form for Time Record and Cost Data on rear.

and progressively planned and thus becomes the means by which new experiences and added knowledge may be incorporated in the program.

The Job Requisition form (a single 8½ x 11 sheet, printed on both sides) carries a serial or reference number in the upper left hand corner, and provides spaces for Assignment data, Orders, Job Report, Time Card Report, Material Used, and Cost Accounting Data.

A file of Job Requisitions on any item of equipment becomes a detailed historical record of the service, inspection and maintenance given that equipment. Consequently, their final disposition is in a file drawer grouped by equipment numbers. The J. R. reference number recorded in the Property Index (Directory) allows the finding of any Job Requisition record within such a group.

The Planned Maintenance System in Operation

Planned Maintenance must be dovetailed with emergency maintenance, improvement maintenance and new construction. In turn, all of these must be balanced against the man-power available and plant operating schedules and requirements. Such coordination is obtained through the weekly meetings of a Maintenance Planning Committee. This committee is comprised of the Superintendent of Production as Chairman; the Maintenance Supervisor as executive officer; the Sanitary Engineer and two Assistant Engineers.

The directive to the Maintenance Planning Committee is: (1) to administrate the Planned Maintenance Program; (2) to assign priority ratings to current scheduled maintenance, as called for in the Calendar Maintenance Directory, on the basis of available man-power, equipment and service conditions; (3) to pass on all requests for unscheduled maintenance (excluding, of course, emergency repairs which automatically have priority over all other work); (4) to expedite previously assigned but uncompleted work.

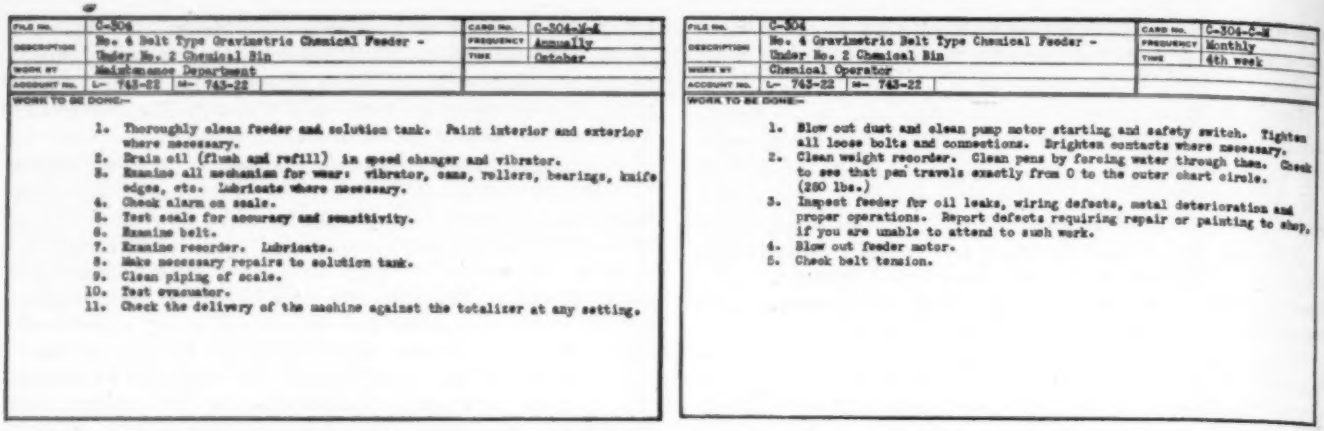
The assignment of priority ratings to all work which is brought before the committee is probably its most important function, especially in days like these when man-power shortages are so very real. The committee reviews the basis for each scheduled maintenance job as it becomes due and also the need for unscheduled maintenance requested by an operator or supervisor. If a job is to require material which is not on hand, the committee may rate the job for material ordering. The job is then again reviewed when the material is received. Or, where a drawing or sketch is to be required the job may be rated for engineering preparation or study. In other cases, the committee after discussion may decide because the use of certain equipment has not been average, that some of the Planned Maintenance may be postponed until the next scheduled period. This method of handling jobs insures Planned Maintenance.

Those jobs receiving the priority rating "Approved" are, during the coming week, "processed" by the Maintenance Supervisor. He assigns the work by means of a Job Requisition to a proper individual and sees that the work is properly completed. A copy of that assignment is placed in a Current Work drawer file, under the name of the person to whom assigned. When the Job Requisition originates from the Planned Maintenance Program, the assignment copy for the Current Work file is a permanently retained 5 in. x 8 in. Mainte-

I-300 Intake Pump Facilities and Auxiliaries
I-301 No. 1 Intake Pump and Motor Unit
I-301.01 Pump (16" Worthington Centrifugal)
I-301.02 Motor (Allis Chalmers - 75 H.P.)
I-301.03 Starting Equipment
I-301.04 Suction and Discharge Piping
I-301.04.01 Suction Strainer
I-301.06 Instruments and Gauges
I-302 No. 2 Intake Pump and Motor Unit
I-302.01 Pump (24" Worthington Mixed Flow)
I-302.02 Motor (150 H.P. - General Electric)
I-302.03 Starting Equipment
I-302.04 Suction and Discharge Piping
I-302.04.01 Suction Strainer
I-302.06 Instruments and Gauges
I-303 No. 3 Intake Pump and Motor Unit
I-303.01 Pump (20" Worthington Centrifugal)
I-500 Intake Electric Power Supply Equipment
I-501 Transformer Substation
I-501.01 No. 1 Bank (three 100 KVA - Maloney)
I-501.02 No. 2 Bank (three 150 KVA - Wagner)
I-502 Power Distribution Facilities to Intake Pumps from Substations
I-600 River Gauges and Measuring Apparatus

U-500 Construction Equipment
U-501 Tractor (McCormick-Deering Co. - Model I-12)
U-502 Crane (Bucyrus-Erie Co. No. 1050)
U-503 Concrete Mixer (Rex No. A 14623)
U-504 Road Grader (Galion Co. 6 ft.)
U-505 Fresno
U-506 Rotary Scraper (J. D. Adams Co. No. 122)
U-600 Grounds Care Equipment
U-601 Lawnmowers
U-601.01 Power Mowers
U-601.01.01 Goodall Rotary
U-601.01.02 Ideal No. 2
U-601.01.03 Ideal No. 3
U-601.02 Gang Mowers
U-601.03 Hand Mowers
U-602 Plow
U-603 Roller
U-700 Boats and Boat Motors
U-702 Elto 1.8 H.P. Outboard
U-703 Evinrude Zephyr - 5.4 H.P. Outboard
U-710 Boat No. 1 - Metal
U-711 Boat No. 2 - Metal
U-712 Boat No. 3 - Wood
U-713 Boat No. 4 - Wood
U-800 Diving Apparatus
U-900 Portable Water Pumping Units
U-901 Rex No. 14205 6"

Fig. 4. Specimen Pages from the Property Index, Showing Property Identification on Index Numbers Which Designate and Identify Each Individual Unit of Equipment



FILE NO.	C-304	CARD NO.	C-304-M-A
DESCRIPTION	No. 4 Belt Type Gravimetric Chemical Feeder - Under No. 2 Chemical Bin	FREQUENCY	Annually
		TIME	October
WORK BY	Maintenance Department		
ACCOUNT NO.	L- 743-22 M- 743-22		

WORK TO BE DONE:—

1. Thoroughly clean feeder and solution tank. Paint interior and exterior where necessary.
2. Drain oil (flush and refill) in speed changer and vibrator.
3. Examine all mechanism for wear: vibrator, cams, rollers, bearings, knife edges, etc. Lubricate where necessary.
4. Check alarm on scale.
5. Test scale for accuracy and sensitivity.
6. Examine belt.
7. Examine recorder. Lubricate.
8. Make necessary repairs to solution tank.
9. Clean piping of scale.
10. Test evacuator.
11. Check the delivery of the machine against the totalizer at any setting.

FILE NO.	C-304	CARD NO.	C-304-C-M
DESCRIPTION	No. 4 Gravimetric Belt Type Chemical Feeder - Under No. 2 Chemical Bin	FREQUENCY	Monthly
		TIME	4th week
WORK BY	Chemical Operator		
ACCOUNT NO.	L- 743-22 M- 743-22		

WORK TO BE DONE:—

1. Blow out dust and clean pump motor starting and safety switch. Tighten all loose bolts and connections. Brighten contacts where necessary.
2. Clean weight recorder. Clean pens by forcing water through them. Check to see that pen travels exactly from 0 to the outer chart circle. (280 lbs.)
3. Inspect feeder for oil leaks, wiring defects, metal deterioration and proper operations. Report defects requiring repair or painting to shop, if you are unable to attend to such work.
4. Blow out feeder motor.
5. Check belt tension.

Fig. 5. Maintenance Cards

These 5"x8" cards are also copies of the insert sheets in the Property Maintenance Directory. When scheduled maintenance is assigned the covering card is transferred to the "Current Work File" under the name of the employee given the assignment. When the work is not current the card is held in a rotating Calendar File until its due date causes it to turn up at the proper time.

nance Program Card (Fig. 5) and the name of the person and date of that assignment is transcribed on the "service record" columns of the Property Maintenance Directory. When the Job Requisition is from an unscheduled memo, the assignment copy for the Current Work File is a carbon copy of the upper portion of that Job Requisition, 5 in. x 8 in. in size.

These two records of assignments (The Current Work File and the Service Record in the Property Maintenance Directory) will give a continuous story as to what work is in the possession of any individual or in possession of the maintenance department as a whole. Further, the Property Maintenance Directory will show that assignment has been made to a certain individual on a certain date and that maintenance is in progress.

When the assigned work has been completed, the job report is made out on the Job Requisition by the individual doing the work. These Job Requisitions which include time, material and other pertinent data are then returned to the Maintenance Supervisor for review and approval.

The approved Job Requisitions are passed on to a maintenance department clerk, who removes the assignment copy (either 5 in. x 8 in. card or duplicate J. R.) from the current work file and completes the "service record" in the Property Maintenance Directory. The completed Job Requisition is finally filed in a Property Maintenance File to form a page in the historical record of that equipment. The permanent 5 in. x 8 in. maintenance assignment card is returned to a rotating calendar card file for future use.

Conclusion

The system of Planned Maintenance which has been described satisfies the following objectives:

(1) To schedule inspections, lubrication and necessary repairs on a definite periodic basis.

(2) To calendar preventative maintenance work so that it is evenly scheduled throughout the year, thereby eliminating excessively busy weeks for the maintenance crew and possible haphazard inspections.

(3) To systematize scheduled maintenance work so that it is properly and without fail, referred to the maintenance department or crew making it unnecessary to depend upon the memory or private notes of the maintenance supervisor or superintendent as to when work is scheduled.

(4) To provide a simple procedure for changing the frequency of inspections as determined by experience, or because of a change in operating conditions.

(5) To provide an historical record, easily and quickly accessible, of the maintenance work called for and done to each item of equipment.

(6) To itemize what must be looked for on an inspection, with sketches when necessary, so that inspections are standardized regardless of who makes the inspection and so that nothing is inadvertently overlooked.

(7) To schedule maintenance work so that similar or related work is done together, thereby utilizing available man-power to best advantage.

(8) To allow a running record of assigned but uncompleted work in possession of a maintenance crew or individual.

(9) To provide a readily accessible record of the total maintenance work assigned to be done in any month of the year.

(10) To provide a readily accessible record of the maintenance work to be done on any equipment at any time during the year.

(11) To provide a means by which the cost of maintenance of any item may be determined.

The practical value of this system of Planned Maintenance has been demonstrated over a period of years in operation of the St. Louis County Water Co. The maintenance men who work under the system appreciate the *definite* and *regular* work assignments it provides. Plant operating personnel have confidence in it as a dependable means of keeping their equipment in good order. Plant supervisors are highly enthusiastic about it because of the comparatively trouble-free operation they have experienced since its inauguration. Amongst other things those disconcerting night and emergency telephone calls have become infrequent.

The system is designed to require a minimum of clerical work needed to fulfill the objectives. Such clerical work as is required has been coordinated with payroll, stores records and other clerical routine jobs required in the plant. It has been discovered that actually less supervision is required in administrating this system than was formerly required when maintenance was not systematically planned and scheduled.

WATER SUPPLY INTERCONNECTIONS IN WESTERN NEW YORK

By NEWELL L. NUSSBAUMER
Commissioner of Public Works
CITY OF BUFFALO
and
ALFRED KREHBIEL
Town Engineer
TOWN OF TONAWANDA, N. Y.

IN 1941 The National Board of Fire Underwriters, together with Mr. Earl Devendorf of the New York State Department of Health, now Water Coordinator of the State of New York, proposed a plan of reinforcements both in supply and distribution for the water supply systems along the Niagara River, including:

(a) The Western New York Water System, supplying most of the towns and villages adjacent to Buffalo, N. Y., beginning with the City of Lackawanna on the south, including the Town of Cheektowaga on the east, where a number of war industries are located, and ending on the north with the Town of Tonawanda, where there have been located for years many large chemical, automotive, steel and rubber industries, and where now there are other war industries in addition.

(b) The City of Buffalo, N. Y., which has been restricted in the past from selling water outside the city limits except in a few cases.

(c) The Cities of Tonawanda and North Tonawanda, which are adjacent to each other but on opposite sides of the New York State Barge Canal. The relationship of these various communities can probably best be understood by referring to the accompanying map.

Water Facilities of the Communities

The City of Buffalo has a filter plant rated capacity of 160 mgd., and for short periods has operated in excess of 200 mgd. During this war period some industries have increased their consumption considerably, even doubling it in a few cases among the larger consumers.

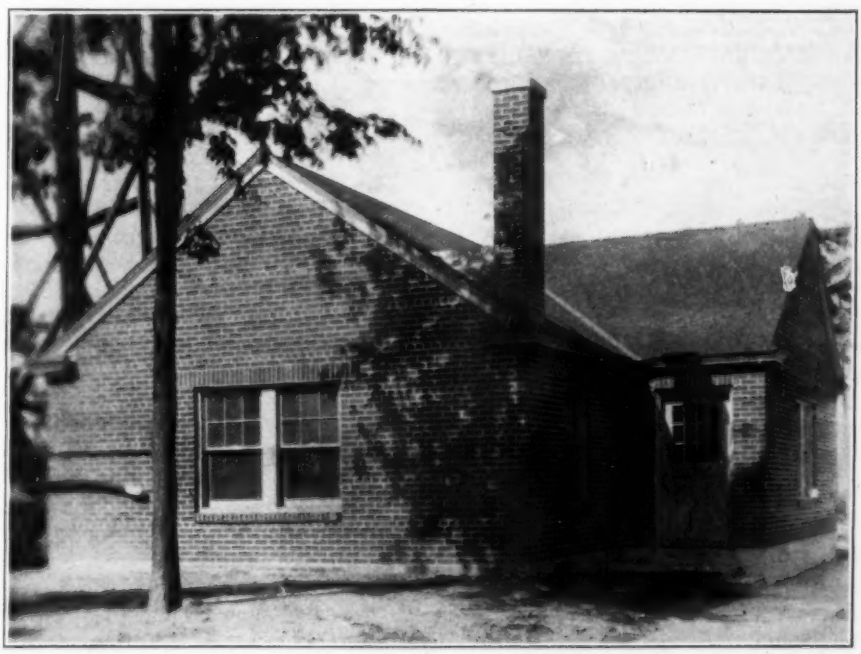
On the other hand, there have been a number of large consumers whose businesses have not increased on account of the war, or whose manufacturing processes have changed with a reduction in water use. In fact, three among the fifteen largest consumers are using about half that of the peace-time peak. The result is an increase of about 10 per cent in water consumption during war years over immediately preceding peace-time years. The average consumption in Buffalo in 1942 has been about 130 mgd., with peaks not exceeding 180 mgd. Therefore, Buffalo can safely spare some water for sale to the outlying communities.

The Senior Author

The Western New York Water Co. has a rated filter capacity of 16 mgd., and has been supplying water at 19 to 20 mgd. Recently completed improvements to the system have helped in continuing the water supply at a rate in excess of 16 mgd.

There are certain sections of the Western New York Water Co. territory (supplied either wholesale or retail) which, prior to the construction of the interconnection improvements, received inadequate volume and pressure. These deficiencies were partly attributable to overloaded conditions in the system and partly due to lack of proper distribution trunk mains in some of the areas, particularly in the Town of Tonawanda, which is at the extreme end of the system, approximately 25 miles from the Lake Intake and Treatment Plant.

The cities of Tonawanda and North Tonawanda (not to be confused with the Town of Tonawanda) each have separate intakes and filter plants but no storage. There was no connection between the two distribution systems, nor between the City of Tonawanda and that of the Town of Tonawanda.



Exterior View of City of Buffalo-Kenmore Pumping Station Interconnection
(May supply up to 7 mgd.)

The area embraced by these communities has been described as the fifth most important industrial area in the United States producing war supplies. Therefore, a program of reinforcement and interconnection was essential to safeguard the industrial production and well being of the inhabitants.

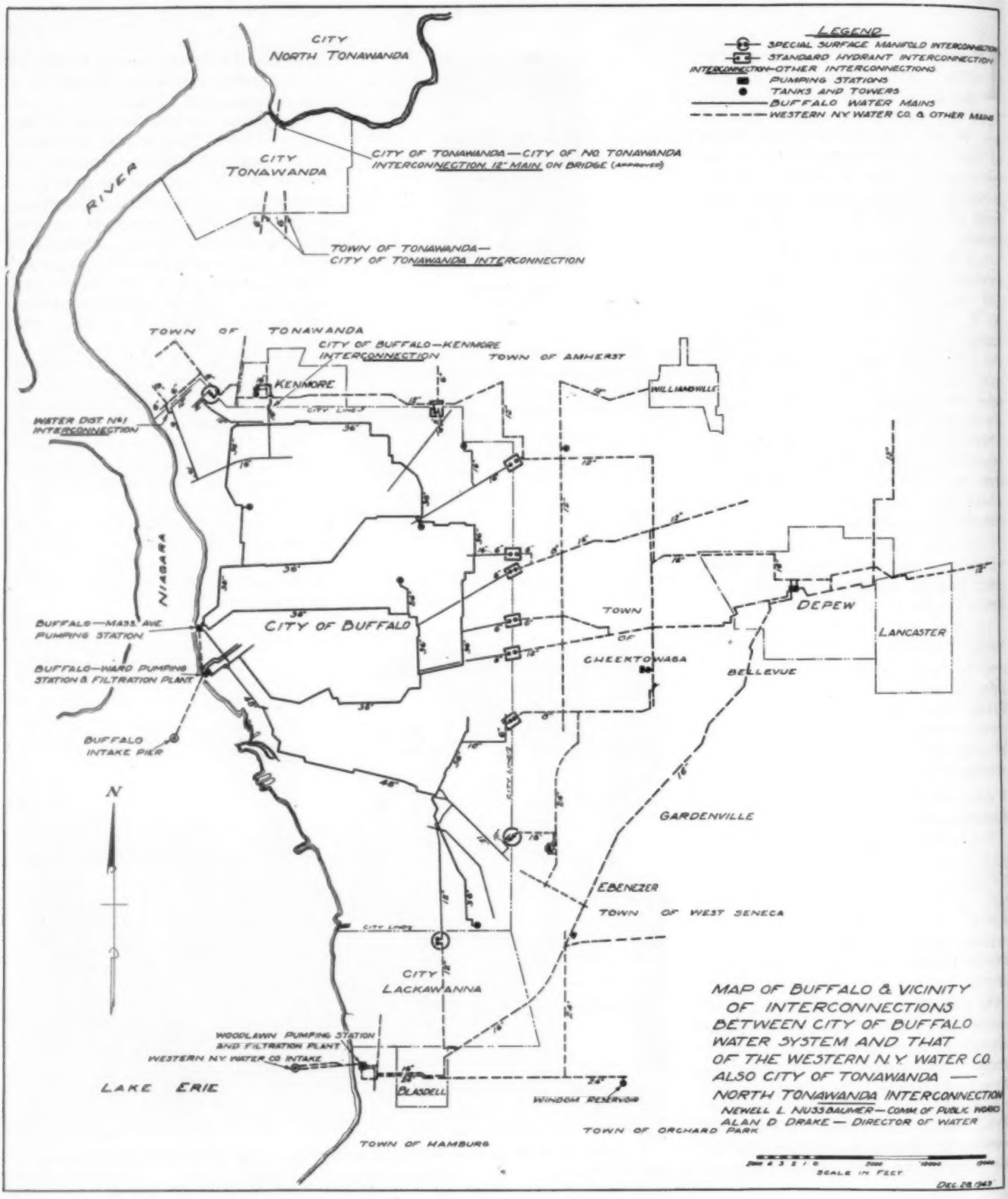
Recommended Interconnections

The National Board of Fire Underwriters' report recommended ten connections between the City of Buffalo and the Western New York Water Co., and one between Buffalo and the Village of Kenmore, together with reinforcements to the distribution system in the Town of Tonawanda. The State Water Coordinator suggested, in addition, connections between the Town of Tonawanda and the City of Tonawanda, and between the cities of Tonawanda and North Tonawanda.

The legal and financial requirements of the program were more difficult to work out in some respects than the construction, although construction was complicated by the necessity of using as few critical materials as possible and the need for securing priorities.

The interconnection program involving Buffalo included:

(a) Nine connections of an emergency type, with no physical or per-



manent connection. A hydrant was installed on the Buffalo distribution system a few feet from the city line, and a second hydrant connected to the Western New York Water Co. was located on the other side of the city line so that an emergency hose connection could easily be made between the two hydrants when required. Because there is a higher pressure carried in the Western New York system than in Buffalo, mobile pumping units driven by gasoline engines are located at convenient points to service the connections when required.

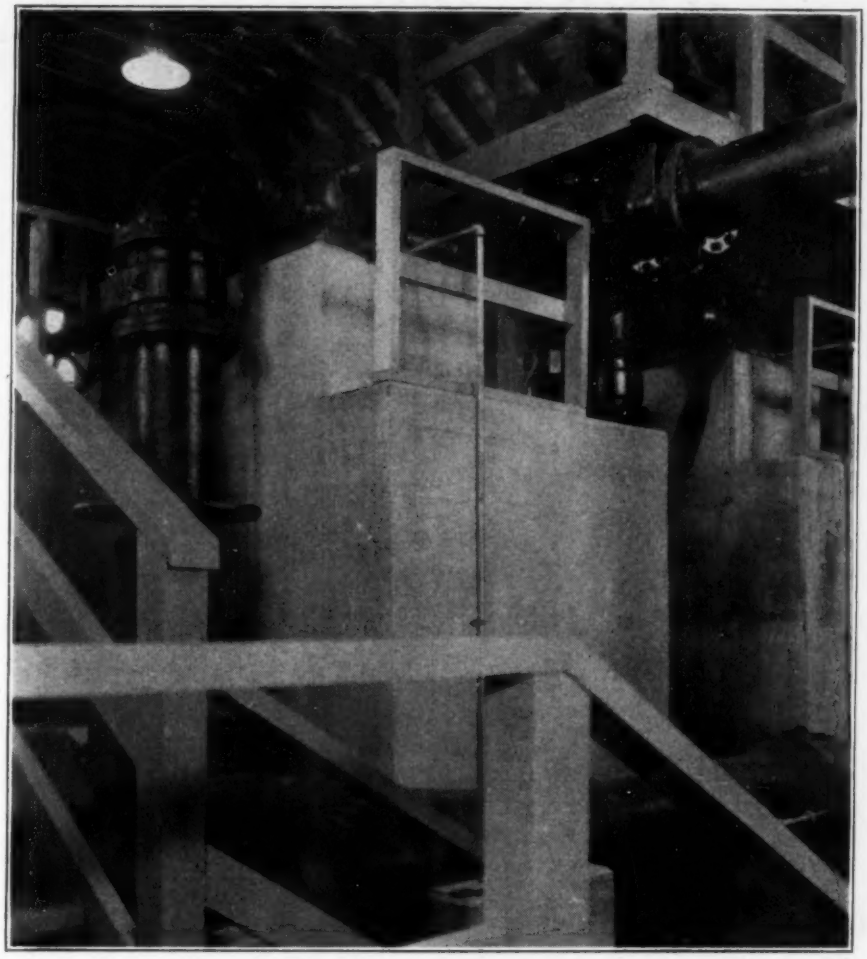
(b) One connection in southeast Buffalo serves as an emergency suction line to a booster pumping station in the Western New York Water Co. system. When the normal supply to this station is inadequate, the alternate line can be used to supplement the supply.

(c) One connection in north Buffalo serves the Village of Kenmore. The village is a regular customer of the Western New York Water Co., using from 1.5 to 3 mgd. When the industrial demand on the Western New York system is heavy, Kenmore, near the end of the line, has an inadequate supply. The village has a million gallon storage tank which rides on the distribution system. Because the water plane in Kenmore is higher than Buffalo, a pumping station is required to fill the Kenmore tank from the Buffalo system.

The station as built includes two pumping units which can work in parallel or tandem, depending upon whether pressure or volume is the more necessary. Automatic controls place the pumps in operation when the tank water level falls to a low point and stops the pumps when the tank is filled or when the pressure in the City of Buffalo mains drops below a designated minimum.

Reinforcements to the distribution system in the Town of Tonawanda were recommended to include two elevated steel water storage tanks and trunk distribution mains to give added pressure and volume to areas experiencing inadequate service.

This was amended due to priority restrictions to include a lesser amount of mains, ground storage tanks, and a booster pumping station. Eventually the trunk distribution mains were constructed, the storage tanks and pump station omitted, and a connection to the Village of Kenmore system made instead. All of the facilities are now substantially completed and available for use.



Interior View of Pump Station
(Shows general arrangements of interior piping connections to and from service mains to pumps.)

Financing the Program

The interconnection system with the City of Buffalo was financed entirely by the Federal Works Agency, including the purchase of mobile pumping units. The plans for the work were prepared by the Water Department of the City of Buffalo. The project was known as F. W. A. Project NY 30-201.

The reinforcements to the Town of Tonawanda distribution system were financed approximately one-half by the F. W. A. and one-half by the town. The plans were prepared by Nussbaumer and Clarke, Consulting Engineers, and the construction was supervised by the town engineer and the consulting engineers. This project was known as F. W. A. Project NY 30-196. The total cost of the entire program exceeded $350,000.

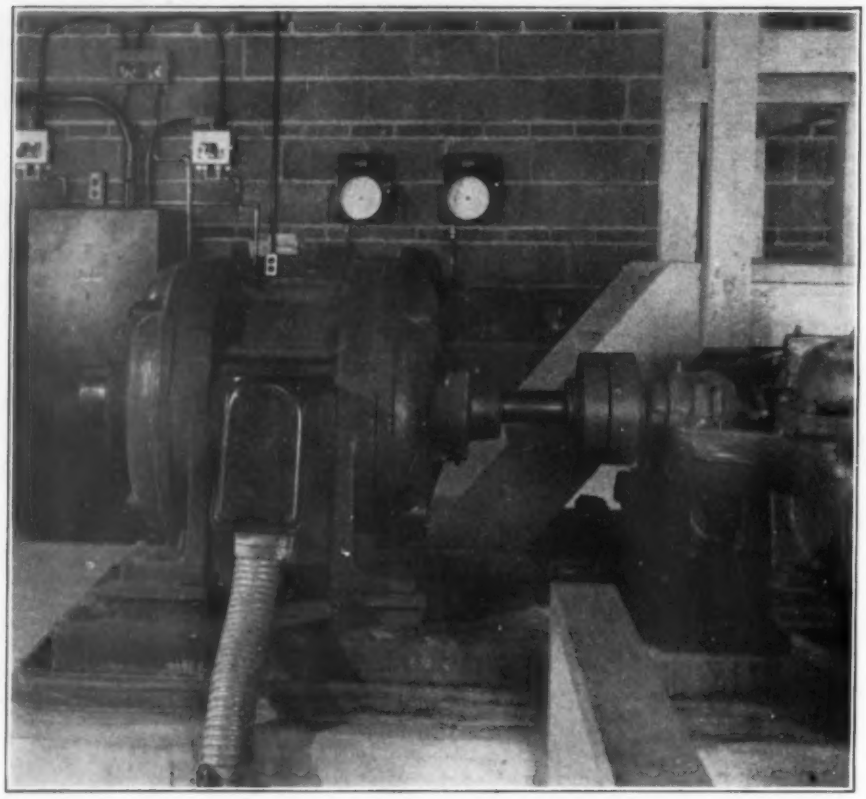
The local communities were at first opposed to financing any part of the program because they felt the impact of the war, which caused increased needs for water by industry, and war housing projects, which might be temporary, should be financed by Federal Agencies and not by local taxation. Agreement was reached, however, as above stated.

The State Water Coordinator gave permission for the construction of the facilities under the War Act passed by the New York State Legislature.

Legal Aspects

The City of Buffalo at first was advised that even under this Act they had no right to sell or distribute water outside the city limits. A decision of the State Attorney General construed the Act as giving the city the right; so the City Council approved of the sale of water outside the city with certain restrictions.

The city is authorized to sell 7 mgd. with not more than 5 mgd. through the Village of Kenmore connection. As Kenmore at peak times will not use over 3 mgd., assuming that Buffalo serves their entire consumption, then they would be in a position to resell to the Town of



Pump Station Interconnection
(Motors and pumps, tank water level controls and wartime starting equipment)

Tonawanda 2 mgd. or more, depending on circumstances. The amounts sold through the emergency connections would probably be only in the case of fire, disaster or enemy attack, and would probably not be for any great length of time.

Since the Kenmore connection has been placed in operation there has been a rise in pressure over the entire village and the western part of the Town of Tonawanda, with no complaints of inadequate volume. At one war industry the pressure was increased about 35 lbs. to a satisfactory working pressure in the plant.

The connections between the Town and City of Tonawanda and North Tonawanda have been completed. These are proposed to be used in case of emergency and, as one has not occurred, they now constitute standby facilities.

Operation of Facilities

The F. W. A. paid 100 per cent of the cost of constructing the interconnection facilities involving Buffalo but do not operate the facilities. A lease has been arranged so that Kenmore operates the pumping station and facilities within the village with village forces. The City of Buffalo Fire Department and Division of Water have custody of the mobile pumping equipment, hydrants, and meters within the City of Buffalo, and the Western New York Water Co. maintains the water mains and hydrants in their territory.

Until December 23, 1943, there was no occasion for the use of the emergency facilities. The whole area was, however, interconnected for water service so that in case of attack, sabotage or conflagration the unaffected area could help those in distress.

On the night of December 23, ice partially closed off the intake of the Western New York Water Co. for a number of hours. When this was discovered, the company requested the opening of the Indian Church Road connection and water at the rate of 4½ mgd. was supplied to their system from the City of Buffalo. Other connections at Roesch Avenue and Vulcan Street (see map) during this period probably supplied water at an equal rate, so that the total rate of supply from Buffalo to the Western New York system for a short time was about 9 mgd., or, roughly, one-half the company's load.

The very next day a large 60-inch force main leading from the Ward Pumping Station in Buffalo ruptured, causing a pressure drop in the city from 75 to 20 pounds. It required two and one-half hours to mobilize the repairmen and operate the necessary valves to close off the section of pipe which had broken. Three valve turning machines recently purchased through the Office of Civilian Protection assisted largely in doing this work in such a short time.

The fire department mobilized all of the auxiliary firemen under the Civilian Protection Organization. If a fire had broken out during this period, the interconnections from the Western New York Water Company into the City of Buffalo would probably have been used. These two incidents definitely prove the value of interconnections between water supply systems.

Horace Brown 32 Years at Ottumwa

Commemorating his thirty-second year of service as Superintendent of the Municipal Water Works at Ottumwa, Iowa, Horace A. Brown was tendered a surprise party by twenty-two employes of the Water Works.

Appreciation of his employees was expressed not only by the presentation of a lamp, but also by calling attention to the fact that he kept "water works employment out of politics, provided security for employes in their old age, and maintained a wage scale comparable with those in other water works."

H. A. Brown

Mr. Brown's tenure as Superintendent has seen the construction of a water softening plant, the elimination of a water works debt, and the quadrupling of the miles of mains installed.

Mr. Brown is probably best known throughout the country for his successful treatment of a water supply that became about half sewage in 1940, when he used the phenomenal dosage of 110 ppm of chlorine in order to effect the then very new "breakpoint chlorination" for removal of taste and odors. The relating of his experiences before the A.W.W.A. rated as the water treatment epic of all time.

A CROSS CONNECTIONS VALVE ARRANGEMENT

Designed to Give Positive Protection and Proven in Service

By MARTIN M. SYMONS
Chief Engineer
INTERSTATE WATER CO.
DANVILLE, ILL.

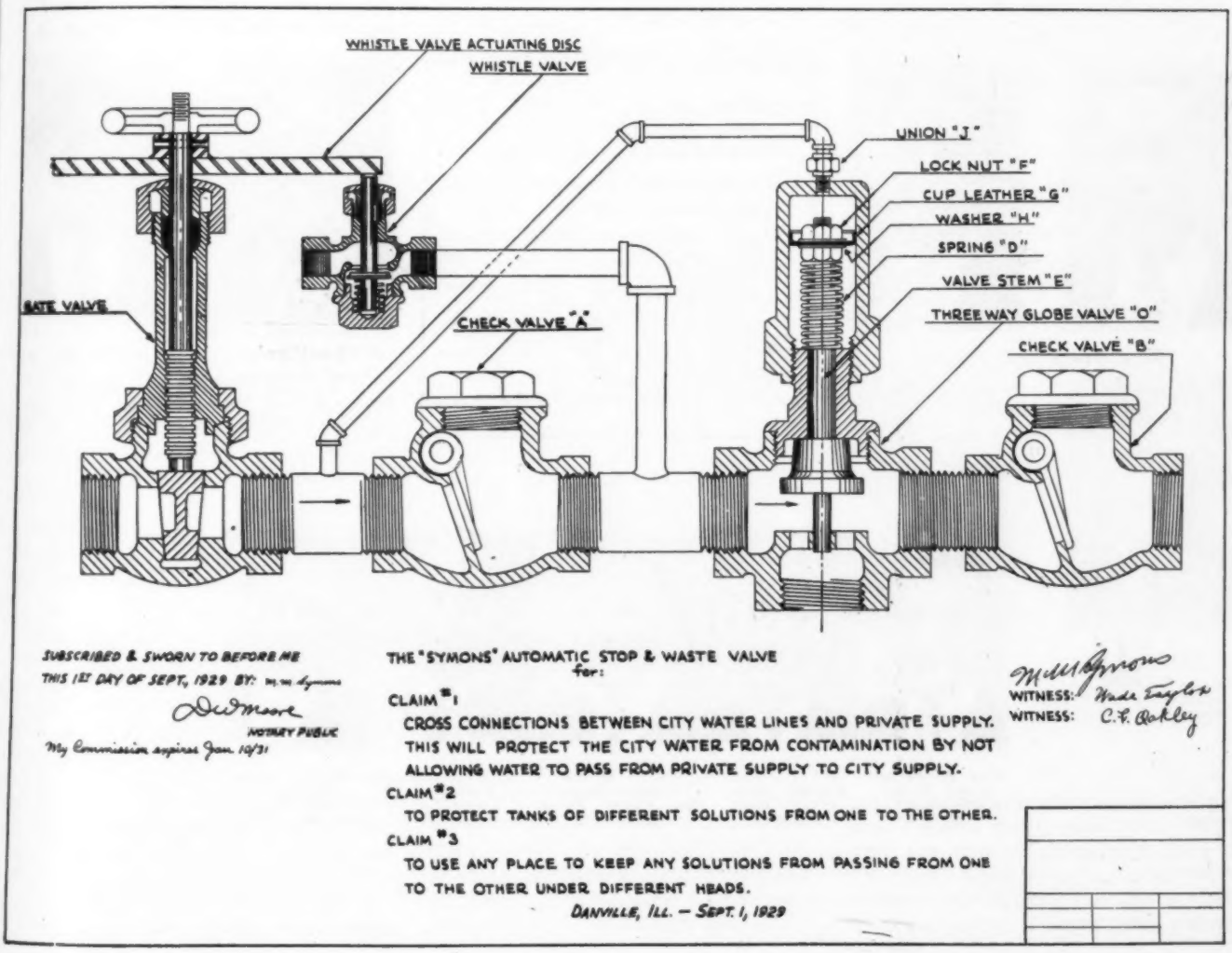
IN the past several years, the American Public Health Association and the Conference of State Sanitary Engineers, has specifically objected to cross connections with private water supplies. And rightly so, for the possibility of pollution of a public water supply by untreated private supplies is a constant threat.

Unfortunately, perhaps, it is not always possible to avoid cross connections, and an article in the September, 1943, issue of WATER WORKS AND SEWERAGE, by Fred A. O. Almquist describes the use of approved double check valves and presents performance records revealing their relative reliability as a means of preventing possible contamination of the public supply where a cross connection is necessary.

The Author and Inventor

Several years before the water works profession, sanitary engineers, and department of health engineers came out against cross-connections, the writer had already undertaken steps to prevent possible pollution of the Danville, Ill. water supply by cross connections with private supplies.

These steps culminated in the ultimate design of a fool proof and positive protection cross connection device, shown in the accompanying sketch. This device was given ample opportunity to prove its performance before the accompanying drawing was made as the basis of a patent application, as the inscriptions on the sketch indicate. The patent has never been applied for, and the device has remained in the writer's


WHISTLE VALVE ACTUATING DISC
WHISTLE VALVE
UNION "J"
LOCK NUT "F"
CUP LEATHER "G"
WASHER "H"
SPRING "D"
VALVE STEM "E"
THREE WAY GLOBE VALVE "O"
CHECK VALVE "B"
GATE VALVE
CHECK VALVE "A"
SUBSCRIBED & SWORN TO BEFORE ME
THIS 1ST DAY OF SEPT, 1929 BY: M. M. Symons
D. W. Moore
NOTARY PUBLIC
My Commission expires Jan. 19/31
THE "SYMONS" AUTOMATIC STOP & WASTE VALVE
for:
CLAIM #1
CROSS CONNECTIONS BETWEEN CITY WATER LINES AND PRIVATE SUPPLY. THIS WILL PROTECT THE CITY WATER FROM CONTAMINATION BY NOT ALLOWING WATER TO PASS FROM PRIVATE SUPPLY TO CITY SUPPLY.
CLAIM #2
TO PROTECT TANKS OF DIFFERENT SOLUTIONS FROM ONE TO THE OTHER.
CLAIM #3
TO USE ANY PLACE TO KEEP ANY SOLUTIONS FROM PASSING FROM ONE TO THE OTHER UNDER DIFFERENT HEADS.
DANVILLE, ILL. – SEPT. 1, 1929
M. M. Symons
WITNESS: Wade Taylor
WITNESS: C. F. Oakley

private archives until persuaded to publish it here.

The Automatic Stop and Waste Valve

The Automatic Stop and Waste Valve, as the device is called, employs two check valves, a gate valve on the municipal supply, a special three way globe valve, and a whistle valve. There will, of course, be required a gate valve on the private supply line connection also.

The principle of operation of this Automatic Stop and Waste Valve is simple, positive, and direct. By referring to the accompanying drawing it will be seen that when the gate valve on the municipal supply is opened to allow water to flow into the private system, the following actions take place. The whistle valve actuating disc releases pressure on that piston, allowing the valve to close; check valve "A" opens and water is discharged from the bottom of the three way globe valve, while pressure is being exerted on cup leather "G" to close the three way globe valve. When the pressure has been fully exerted to overcome the upward force of the spring "D," the globe valve is closed and water no longer escapes, but passes on opening the check valve "C," and into the private system. So long as pressure on the municipal system is higher than that on the private system, this valve will function in the above manner and water will be delivered in the direction of the arrow.

If the main line pressure should drop, check valve "B" will close, and the globe valve will open as soon as the pressure has dropped to a point where the spring "D" will open this valve. The tension on this spring can be set for any desired differential so that the globe valve will open at the specified drop in pressure. Even if check valve "B" should leak or fail to close any back-flow from the connected supply will be wasted to a drain through an air gap, the latter being for the sake of visibility and additional safety.

The whistle valve is a signal in case of failure of the system to work, when the main gate valve is closed. If the check valve "B" fails, and the globe valve is not open for some reason, the water will escape at the whistle valve, giving a warning.

This special cross connection double check and automatic stop and waste valve can be made for any size line, but requires special fitting for the larger size mains. For lines of less than two inches, the special three way valve may be made without the positive water plunger closing feature. Water pressure on the disc will close the valve against a small spring in the valve housing.

As indicated in the drawing, this valve will have other applications than to cross connections in water supplies. It may be used to connect any two systems of different heads. These special valves are not being commercially produced, but the writer can have them made on special order for anyone interested in obtaining one or more.

"Just for the Sake of the Record"

Secy.-Treas. and Trustee

J. B. Harrington
Chief Engr.
State Dept. Health
Charleston, W. Va.

Cable H. Cramer
Mgr., C. K. & C.
Water Co.
Kenova, W. Va.

When we do something we usually do it thoroughly; and this case was no exception.

We refer to the switching of several names and faces in our March report of the W. Va. Section Conference.

For the sake of the record, we present here a "re-shuffle," in which we pray that all names and faces will this time come out as on the original copy.

Vice-Chm'n

Paul Simmons
Chemist
Weirton Imp. Co.
Weirton, W. Va.

Director

T. L. Young
Manager
S. S. Water Co.
Chester, W. Va.

Wm. Kirchman
Supt. Filter
Fairmont, W. Va.

W. G. Yates
Constr. Engr.
Water Dept.
Wheeling

"Art" Welch
Distr. Mgr.
Ind. Chem. Sales
Phila., Pa.

A. L. Rhoads
Manager
Water Co.
Bluefield, W. Va.

"Steve" Davis
Manager
Water Works
McMechen, W. V.

NEWWA'S MARCH MEETING

THE monthly meeting of the New England Water Works Association quite generally may be counted on to offer something of interest to those who attend. This one was no exception. Climaxed by a motion picture showing the historic defense of Russia and the battles of Leningrad and Stalingrad, this meeting at which 160 were in attendance, gave food for thought on many subjects.

Coefficients of Meters and Lines

Continuing the Water Works School of NEWWA, Prof. George E. Russell of M.I.T. presented a lecture on "Coefficients for Metering Devices and Pipes." In spite of the fact that this topic dealt with the forbidding subject of the Reynolds' Number, Prof. Russell gave forth in his usual engaging manner and left the audience with more than a casual conception of turbulent and laminar flow and the causes and effects thereof.

Without attempting to reproduce here the steps by which Prof. Russell developed the explanation of the Reynolds' Number and its relation to the coefficient of friction, it is sufficient to quote a few of his statements bearing on the subject.

"All liquids and gases obey the same basic laws of fluid flow. . . . All fluid friction is caused by the viscosity of the liquid which in turn is dependent on the temperature. . . . Skin friction or friction between the liquid and the pipe surface does not exist because, in general, liquids wet the surface. Therefore the so-called skin friction is in reality the shear force between the flowing liquid and the liquid adhering to the wetted surface. . . . Viscosity, represented by the Greek letter mu, is experimentally measurable, varies with temperature for each liquid and is different for different liquids.

"In all fluid flow there are two types of motion, laminar flow and turbulent flow. . . . Laminar flow in a pipe line may be pictured as concentric cylinders of liquid, each moving without disturbing the other and the center one moving the most rapidly. . . . In turbulent flow the path lines of individual particles cross and recross one another and vortices are formed. . . . Particles have two characteristics, first, inertia or the tendency to continue in a given path, once started, until some force opposes that motion, and secondly, the tendency to adhere together and produce a viscous drag. . . . When the viscous force exceeds the inertia force, laminar flow results; when the inertia force is greater than the viscous, turbulence results.

"The ratio of these two forces is a pure number known as Reynolds' Number, designated by **R**. It is obtained by multiplying the velocity of flow (ft. per sec.) by the density of the liquid and the diameter of the pipe (in ft.) and dividing the product by the coefficient of viscosity of the liquid at the temperature used. The resulting number may be anywhere from 100 to 1,000,000 or more. . . . The coefficient of friction which occurs in any formula for determining quantity of flow from a closed measuring device (Venturi tube, pipe, diaphragm orifice, or flow nozzle) varies with the Reynolds' Number.

"For Reynolds' Numbers up to 2,000, flow in pipes is laminar while above 3,000 the flow is turbulent. . . . In the formula for loss of head in a pipe, the friction coefficient (f) depends solely on the value of **R**. . . . A plot of (f) against **R** for a pipe of given roughness produces a curve that applies to the flow of any fluid through a pipe of like roughness.

"In general two flows having the same **R** value have identical characteristics. . . . Different curves showing the relation between **R** and the friction coefficient exist for different measuring devices, and these differ in form with each device. . . . These curves make it possible to build and test exact scale models of large metering devices."

Presided
Horace L. Clark
Supt. Water Dist.
Sanford, Me.

Reported
Geo. A. Sampson
Const. Engr.
Boston, Mass.

In the question period Scott Kieth of Metcalf and Eddy, Boston, pointed out that wide changes in temperature (from near freezing to boiling) made a difference of ± 20 per cent in the Hazen-Williams flow formula. Mr. Kieth also said that not knowing the viscosity of sludge had caused failure of sludge lines in some instances.

Superintendents Round Table

Meter Maintenance was the subject of the discussion led by William B. Duffy, Supt., Dept. Pub. Wks., North Andover, Mass. Most pertinent observation by Mr. Duffy was that since 1937 when a new system of meter maintenance was inaugurated in North Andover revenue had increased while pumpage had remained fairly constant.

This new meter repair practice amounts to factory repair service. That is, meters removed for checking have complete new parts inserted, where parts show wear. Old parts are returned to the factory for repair. For meters having ages averaging 25 years this practice has proved beneficial, because the expenditure of every $1 per year for repairs has brought in $2 in increased revenue.

The effort is made to put meters in shape so they will register 98 per cent correct at ¼ gpm flow. With only one man working part time in the meter department it is planned to inspect and repair all of the utility's 1800 meters in a seven year period.

Leader
Wm. B. Duffy
Supt. Pub. Wks.
No. Andover, Mass.

Teacher
Geo. E. Russell
Prof. Hydraulics
Mass. Inst. Tech.

The following table shows the registration of a group of ⅝-in. meters before repair and the cost of repair parts.

No. of Meters in Group	Per Cent Registration at Flows of ¼ gpm	1½ gpm	12 gpm	Average Cost of Repair Parts Per Meter
42	98	103.2	100.8	$3.21
24	93.8	99.5	98.3	5.46
19	86.3	99.3	98.4	4.89
24	0.0	82.5	96.9	5.13
Total 109				Overall Avg. $4.45

Mr. Duffy gave the following answer to questions from the audience. "The consumer owns the meter but the utility pays for the repairs. . . . While the meter is removed for repair the consumer receives free water."

The Chemists' Round Table took up the topic of "Corrosion Problems." Lazarus Rubin, Sr. Chemist, Mass. Dept. of Public Health, was the discussion leader. Among the items covered was the effect on reducing corrosion by the use of lime, sodium silicate and Hexa-metaphosphates.

Luncheon

Following lunch Secretary Gifford announced the passing, on March 3, of Henry T. Gidley of Fairhaven, and the knighting in England of Mr. William Paterson, also a member.

The April meeting has been cancelled, the May meeting will be held at New Hampshire University and the Annual Meeting will be held at Poland Springs, Me., in September.

E. Sherman Chase, reported that in response to action concerning Post War Planning at the previous meeting, most of the New England States had followed the recommendations of NEWWA and had appointed official state planning boards or committees to aid in the development of plans for post war developments in the field of sanitary works.

Mr. Chase also read an excerpt from a letter to Roger Esty, written by a former employee now in the Aleutians. The SeaBee said he was glad to hear of the activities of these Post War Planning Committees because the foremost thought of service men is concerned with the problem of post war employment. "Will they get their old jobs back, or another just as good"?

Water Supply at Military Posts

John J. Stanton, San. Engr., U. S. Engrs. Office, Boston, gave an illustrated talk on some of the problems of supplying water to Military Posts along the New England Coast. World War I design data were outdated and new criteria had to be developed. It was necessary to temper accepted standards of design and construction with available time and available materials.

Provision for fire hazard at air fields and for hydro-pressure fueling stations were but two of the problems.

Most trying difficulty was the frequent need for the provision of a water supply in a very limited time. In one instance, two weeks was available to provide water for 5,000 men, and an additional four weeks to provide for 17,000 additional men. In the former case water from a municipal fire hydrant ½ mile away was piped to the post after cleaning the main to increase the flow from 60 to 240 gpm. The remainder of the supply was obtained from well points also a half mile away. The main to carry this supply was laid by contract in 2½ days of continuous work.

Grounding on Water Pipe

George A. Sampson, as Chairman of the NEWWA Committee on Grounding gave a resume of the "Interim Report of the American Research Committee on Grounding." In brief summary it appears that of 100 complaints investigated including blue water, red water, taste and odor, tank failure, and sediment, not one could be traced to electrical currents caused by grounding to water service pipes. Aggressive water or other characteristics inherent in the water supply or metal were shown to be the true cause of the difficulty.

Mr. Sampson also read the statement of policy of AWWA in which the association disclaims any responsibility for proper connections in use of water systems for anything but to conduct water, and reserved the right to use any kind of pipe or fittings for water services without regard to its use for grounding.

By vote of the assembled members this statement of policy was also adopted by the NEWWA. The meeting closed with a full length motion picture on the Battle of Russia, an excellent documentary film of the U. S. Army showing the actual battles of Stalingrad, Leningrad and other Russian cities.—(G.E.S.)

Aldrich to Continue Practice

Ellwood H. Aldrich has announced that he will continue the consulting engineering practice of Newsom and Aldrich after March 1, when his partner, Reeves Newsom, retired to take up other duties. He will continue the existing organization as Ellwood H. Aldrich, Consulting Engineer, with offices at 500 Fifth Ave., New York City and the Goodwin Building, Williamsburg, Va.

Mr. Aldrich graduated from Beloit College in 1917 and after study at the Massachusetts Institute of Technology, secured his engineering degree at the University of Illinois. After services overseas with the French Army, as an officer in the U. S. Army in World War I, he became City Engineer of Wisconsin Rapids, Wis., and held this position until 1925.

E. H. Aldrich

From 1925 to 1927, Mr. Aldrich was Prin. Asst. Engr. with Morris Knowles, Inc., Consulting Engineer, Pittsburgh, Pa., and from 1927 to 1930 he held the same position with Nicholas S. Hill, Jr., Consulting Engineer, New York, N. Y.

From 1930 to 1938, Mr. Aldrich was engaged in various activities, including private practice. He was also engineer with the Water Bureau of the New York Public Service Commission, and chief engineer for the Community Water Service Co. during a part of this period.

From 1938 until the present, Mr. Aldrich has been a partner of Reeves Newsom in the design, construction, and valuation of water or sewerage projects in many cities. Among the largest of these were the design and construction of additional water supply, filtration plants, and pumping stations for the Cities of Norfolk, Newport News, and Hampton Roads area in Virginia, now approaching completion, at a cost of over $7,000,000.

Mr. Aldrich is active in AWWA, ASCE and the N. Y. State Sewage Works Assn.

THE WATER SUPPLY OF GREENVILLE, S. C.

A Pure, Plentiful and Priceless Asset to a Growing Industrial Community Demanding Good Water

By JOHN L. HAWKINS
Supt. of Water
GREENVILLE, S. C.

GREENVILLE, South Carolina, is an industrial city in the foothills of the Blue Ridge Mountains, with a population of approximately 35,000 inside the city and about 55,000 in the area immediately surrounding the city.

Greenville's water supply system is municipally-owned and supplies industrial as well as domestic water to the city and contiguous territory. At the present time the total consumption for Greater Greenville is averaging 10,000,000 gals. daily.

The Author

Management and Finance

The water supply system is controlled and operated by a commission composed of three men, one of whom is elected every two years for a term of six years. Members of the commission serve without compensation. Their authority is granted by an Act of the State of South Carolina. It is their duty to build and operate all municipally owned utilities; however, in Greenville the water works is so far their sole responsibility. The superintendent of the department is appointed by the commission and enjoys the privilege of selecting the personnel of the department, resulting in a minimum turnover of personnel.

None of the revenue of the department is turned over to the city authorities except that portion required to service the outstanding bonds issued for water works improvements. As a result the department is in excellent financial condition and is able to meet all requirements in pipe line extensions, etc.

The functions of the department are production, transmission, distribution, maintenance and repair, billing and collection, construction of pipe line extensions and other improvements. However, the larger expansion projects are usually done under contract as the department is not sufficiently equipped to handle the larger projects.

All Gravity Mountain Supply

The water supply is taken from Table Rock Reservoir located in the Blue Ridge Mountains northwest of

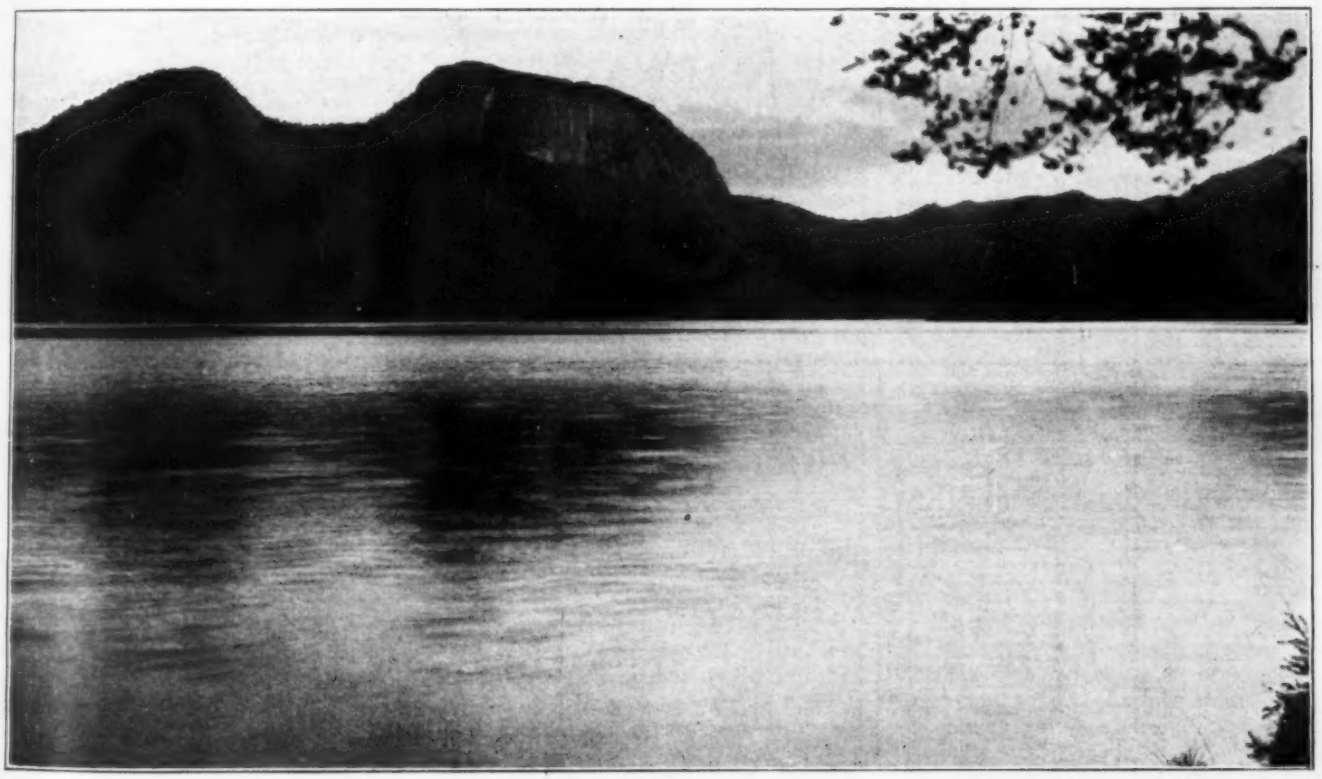
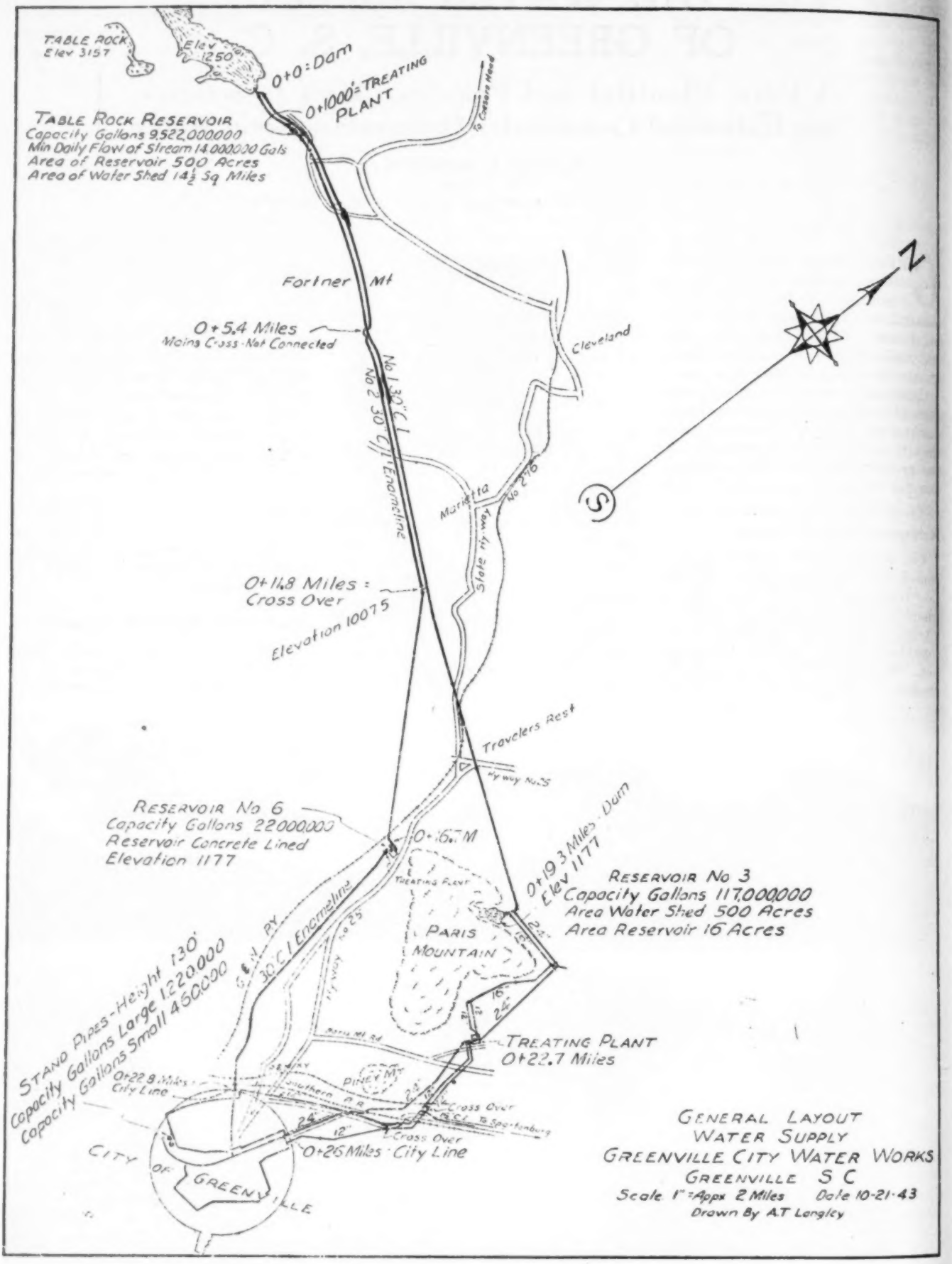


Table Rock Mountain Reservoir, the Source of Greater Greenville's Freestone All-Gravity Water Supply
(A 2¼ mi. long lake of 500 acres; capacity 9.5 billion gallons; minimum stream inflow 14 mgd.; present usage 10 mgd. For elevations and distances see General Plan Sketch of reservoir and system.)



General Plan of Greater Greenville Water Supply System

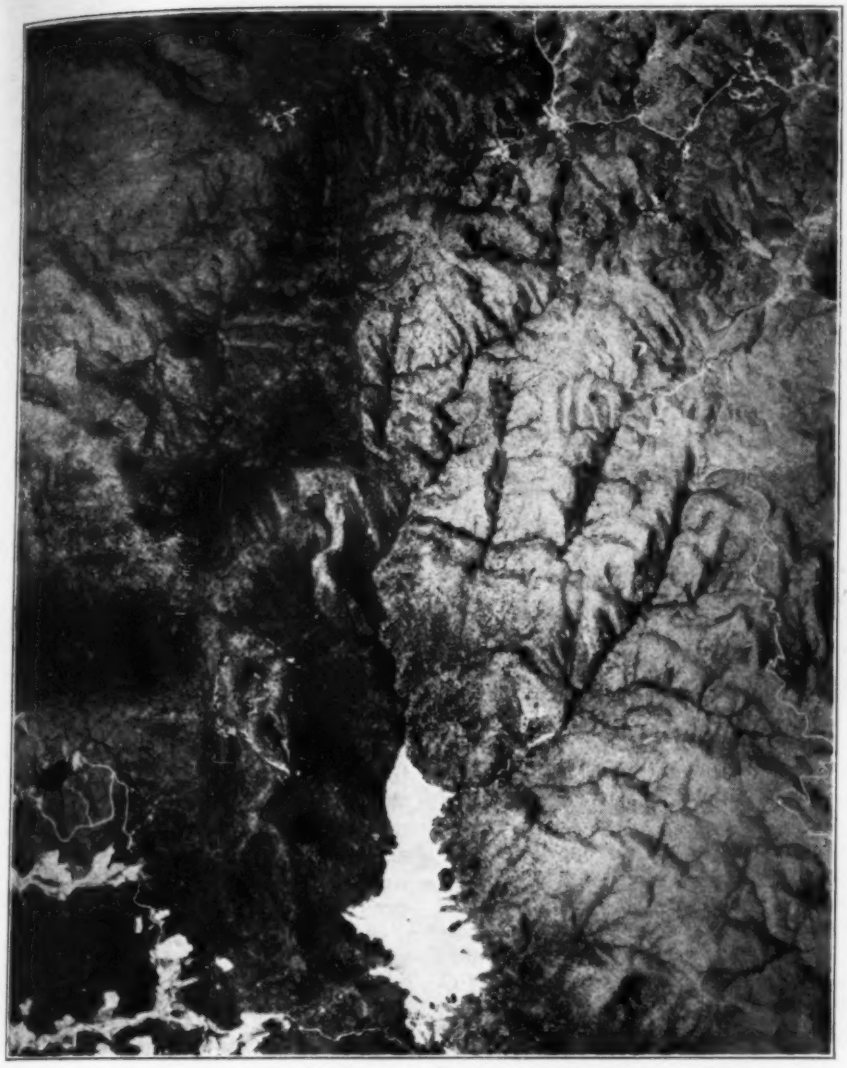


Table Rock Watershed and Reservoir from 20,000 ft. Level

(A 14.5 sq. mi. watershed in a virgin forest area, wholly owned and patrolled by Greenville Water Dept. Looks partially denuded, but is actually heavily timbered throughout. Lake level is elevation 1250 ft. and highest point in area is 3650 ft.)

the city and flows to the city by gravity. All of the 14½ sq. mi. area of the water shed serving this reservoir is owned and patrolled by the Water Department. (See air view.) It is virgin timber land and the area has an annual rainfall of 85 to 95 inches. Many beautiful mountain streams supply this reservoir of 9,522,000,000 gallons' capacity with pure crystal clear water, having a total hardness of but one part per million.

Treatment

The Table Rock water is so clean, clear and soft that no treatment other than pH adjustment for corrosion control, and chlorination for the dual purpose of safety and control of pipe line growths and tuberculation suppression, is required.

At a point 1000 ft. below the dam (Sta. 0 + 1000′ on the accompanying general sketch of the system) the first application of ammonia-chlorine treatment is given through the operation of W & T automatic ammoniators and chlorinators feeding direct into the transmission mains. Here, also, pH correction is accomplished by application of a solution of soda-ash pumped into the transmission mains by Ross Hydraulic Pumps against a pressure of 50 psi. at this point. The solution is injected ahead of a Venturi tube which serves as a dispersion and mixing unit.

A few feet from the down-stream end of the Venturi tube a continuous sample is drawn from the mains and is passed over electrodes from which a potentiometer receives its information and records the pH value. The potentiometer in turn changes the length of the stroke of W&T Type MOF feeders to correct dosage either upward or downward. This control is completely automatic and will compensate for sudden changes or seasonal changes in raw water as well as change the feed rate as the flow fluctuates. At the present time we are treating an average of 10 mgd. at this station. And, incidentally, the minimum daily watershed yield into Table Rock Reservoir is 14 mgd. and our spillway runs merrily on—see picture.

Double Chlorine-Ammonia Treatment

There are two 30-in. cast iron transmission mains running from Table Rock Reservoir to two high level reservoirs on Paris Mountain (see sketch of system). After the water leaves these reservoirs it is again treated with ammonia and chlorine with W&T automatic machines. This second chlorination enables us to deliver water into the fartherest reaches of the distribution system with any chlorine residual desired. The high pressure necessary to operate these machines is provided by Ross Hydraulic Pumps, thereby eliminating the possibility of pressure failures due to disruption of power service.

The reader may wonder why it is necessary to treat with ammonia and chlorine twice. The reason for doing so is that two small towns, two large textile plants and many rural families are supplied from the two 30-in. mains between Table Rock Reservoir and the two high level reservoirs. Then, too, after the treatment at Table Rock Reservoir it would be rather difficult to deliver the water at points within the city thirty-five miles away with a sufficient chlorine residual.

Distribution and In-town Storage

From the two high level reservoirs to the city there are two 12-in, one 24-in. and one 30-in. transmission mains, guaranteeing constant service. The pressures on the distribution system vary from 55 psi. at the highest points to 130 psi. at the lowest points in the business and industrial areas. Two standpipes, with a total capacity of 1,680,000 gals. float on the distribution system. There are master Venturi meters at each of the three treating stations, and customer's services are 100 per cent metered.

As to Water Quality

Already the abundance of supply of all gravity mountain water, requiring but space and economical treatment, has been mentioned. As to quality of the water the accompanying tables of analyses, which reveal average values for the year, tell their own story.

A commercial laboratory in Green-

ville is retained by the Water Department to conduct all analytical work and make recommendations covering treatment, etc. Routine bacterial and chemical examinations are made daily and complete analyses are made quarterly.

From the accompanying analyses it is apparent that the Table Rock water is of a high degree of purity, practically devoid of hardness and a total solids content of only 39 ppm., much of which is comprised of bicarbonate of soda due to the neutralization of carbon-dioxide with soda-ash in the corrective treatment for corrosion suppression. There is a very low iron content after a 26-mile travel through the cast-iron mains from Table Rock Reservoir to the city-line. Water of such quality is a boon to the domestic user and a remarkable asset to the many textile mills in and around Greenville.

TYPICAL
CHEMICAL ANALYSIS*
(Treated Water)

	Parts per Million
Color	5.00
Chlorine (as chlorides)	5.00
Total Hardness	1.00
Calcium Hardness	1.00
Magnesium Hardness	0.00
Alk. to Methyl Orange	15.00
Alk. to Phenolphthalein	1.00
Free Carbon Dioxide	0.00
Total Solids	39.00
Dissolved Solids	38.00
Suspended Solids	1.00
pH (Hydrogen Ion Conc.)	8.3
Residual Chlorine (Free)	0.30

TYPICAL
MINERAL ANALYSIS*
(Treated Water)

	Parts per Million
Sulfates (SO_3)	1.23
Sodium (Na_2O)	11.83
Calcium (CaO)	0.50
Magnesium (MgO)	0.00
Silica (SiO_2)	2.25
Total Iron (Fe)	0.12
Dissolved Iron (Fe)	0.12
Suspended Iron (Fe)	0.00
Organic & Vol. Matter	15.00
Mineral Matter	24.62

Table Rock Spillway
(Runs merrily on while 10 mgd. is leaving via two 30-in. pipe lines.)

HYPOTHETICAL COMBINATIONS*
(Calculated from Typical Mineral Analysis)

	Parts per Million	Grams per Gallon
Calcium Sulfate ($CaSO_4$)	1.22	0.07
Magnesium Sulfate ($MgSO_4$)	0.00	0.00
Sodium Chloride (NaCl)	5.00	0.29
Magnesium Chloride ($MgCl_2$)	0.00	0.00
Sodium Sulfate (Na_2SO_4)	0.91	0.05
Sodium Carbonate (Na_2CO_3)	15.00	0.88
Calcium Carbonate ($CaCO_3$)	0.00	0.00
Magnesium Carbonate ($MgCO_3$)	0.00	0.00
Silica (SiO_2)	2.25	0.16
Total Iron (Fe)	0.12	0.007
Dissolved Iron (Fe)	0.12	0.007
Suspended Iron (Fe)	0.00	0.00
Organic & Volatile Matter	15.00	0.88
Mineral Matter	24.62	1.47

*Analyses by Murray Laboratories of Greenville, S. C. The figures given here represent annual averages.

Financial Status of the System

[Ed. Note: What follows has been taken from a report by Greenville's auditors, Winn and Winn of Greenville, S. C., for the fiscal year ending July 31, 1943. Mr. Hawkins modestly supplied the report, with the suggestion that some of its contents might prove interesting—and indeed they are.]

During the year ending July 31, 1943, the "Net Operating Profit" was $365,954.68 after the operating expense of $86,073.59 was deducted from the $452,028.27 gross income. After bond interest and depreciation charged off a "Net Income" over and above all costs of $179,073.17 was the year's figure "Carried to Surplus."

The "Plant and Equipment" worth is carried at book value of $5,080,847.09 which with other assets brings the worth of the Greenville Water Works to $7,256,466.41 as against a bond debt of $5,519,000. However funds of more than two million are in hand to reduce this bond debt to $3,446,780.69 if by now such bonds haven't already been retired. So it is evident that the Greenville Water Department is doing very well financially and has no more to worry about in this direction than it has with respect to WATER, either in quantity or quality.

Some War Effects on Income and Expenses

In examining the financial report it is interesting to note what the effects of wartime operation have been on income and expenses. Some of the most readily visible effects are the following, when comparing the year previous and the year July 31, 1942-July 31, 1943.

On the "Income" side the increase of $31,094.60 collected for water sold heads the list, but it would have been more by almost $400 except for the fact that customers paid their bills more promptly and the Water Department gave up this additional sum as discounts for prompt payments which it did not in the previous year. Also a deficiency in operating income (war borne) was found in the restricted number of service connections and taps made. The revenue drop in this category was $8,949.98 for the year. In the metering department meter reading cost $901.03 more, and it is interesting to note that maintenance and repair of meters was not permitted to lag, and the expense of $7,038.82 for the year on this 100 per cent metered system supplying 10 mgd. was but slightly under the $7,664.59 spent the year previous.

The war expense item that stands out like a sore thumb on the red ink side of the ledger is the $18,198.98 new expense for "Reservoir and Treatment Station Guards."

The Value of an All-Gravity System

The financial report gives mute but ample evidence of the worth of an all-gravity water system. For the entire system the power bill for the year is listed as "Electric Current" $130.04 for a 10 mgd. plant. Furthermore the extra quantity of water sold at a price of $31,094.60 during the year actually cost the Water Department a mere $1,257.71 to produce—namely, the cost of additional chemicals for treatment. To us that looks like a clear profit of $29,836.89 on the production end—only possible because of the all-gravity system without power charges and the need for but simple treatment of a water of God-given superior qualities.

S.E. Section to Meet in Greenville

On May 8-10, 1944, Greenville will be host to the Southeastern Section of AWWA, at which time all who attend will be taken over this interesting gravity system on a tour of inspection. The Water Department of Greenville extends a cordial invitation.—J. L. H.

N. J. SEWAGE WORKS ASSOC. HOLDS TWENTY-NINTH ANNUAL MEETING

Record Attendance for a Regular Annual Meeting Attracted by Outstanding Program

THE world's oldest sewage works association held its twenty-ninth annual meeting during a two-day session in Trenton, N. J., Mar. 23-24. With a record making registration of 315, the attendance was near the all-time record of the silver anniversary meeting in 1940, which drew many out-of-state attendants.

Retiring President
Henry VanderVleit
Supt. Public Works
Maywood, N. J.

Incoming President
John H. Simmerman
Supt. Public Works
Pittman, N. J.

Object of all the interest in the 29th meeting was a well rounded program, including three symposia with four or five speakers in each as well as two other papers, presentation of two Federation Awards to New Jersey members and a manufacturers' dinner and entertainment. Any one of these features had sufficient interest to draw an attentive audience and did. To give each part of the program its proper due would require far more space than can be alloted under present circumstances, and this reporter can do little more than present a factual report of what took place.

Business Meeting

This being the annual meeting of an even year, officers were elected for the ensuing two years. These included the following:

President—John H. Simmerman, Supt. of Water and Sewerage, Pitman, N. J.

1st Vice Pres.—*Louis J. Fontenelli, Supt. Sewage Treatment, Rahway, N. J.

2nd Vice Pres.—Edw. P. Decher, Executive Secy., Joint Meeting, Elizabeth, N. J.

Secretary—John R. Downes, Supt. Sewage Treatment, Bound Brook, N. J.

Treasurer—Edw. P. Molitor, Supt. of Sewage Treatment, Chatham, N. J.

Exec. Com.—H. Van Der Vleit, Supt. of Public Works, Maywood, N. J.; John Struss, Supt. of Sewerage, No. Wildwood, N. J.

Presentation of Awards

On behalf of the Federation of Sewage Works Associations W. H. Wisely, Exec. Secy. and Editor, presented two awards to members of the N. J. Sew. Wks. Assoc. The Harrison Prescott Eddy Award for Research went to Dr. Harry W. Gehm, of the N. J. Water and Sewage Expt. Station, with the comment that his paper, "The Separation of Grease from Sewage," received a rating of some 15 points higher than its nearest competition. The Kenneth Allen Award for meritorious service to a Member Association went to Edward P. Molitor, for his long and varied services to the New Jersey Association.

This presentation of awards at meetings of the Member Associations brings out the idea of the Federation, and the presence of Mr. Wisely is the embodiment of the fact that a great federation of sewage works associations exists to serve the sewage plant operators throughout the country in several directions.

Federation Award Winners

Edw. P. Molitor
Supt. of Treatment
Chatham, N. J.
(Kenneth Allen Award)

Harry W. Gehm
N. J. Expt. Sta.
New Brunswick, N. J.
(Harrison P. Eddy Award)

The Perth Amboy Treatment Plant

Scheduled as a paper on the changes in the Perth Amboy plant, the author, Richard Oliver, Sanitary Engineer of the City of Perth Amboy, reviewed the construction and operation of the Perth Amboy plant and thereby explained why there had been little or no changes in operation since the plant went into service some eight years ago.

1st Vice-Pres.
L. J. Fontenelli
Supt. of Treatment
Rahway, N. J.

2nd Vice-Pres.
Edw. P. Decher
Act'g Chief Engr.
Elizabeth, N. J.

This treatment plant, completed in 1935 at a cost of $910,000, employs the chemical treatment process and the Laughlin magnetite filter. Chemicals are used only during the summer or when conditions otherwise warrant. Chlorination is maintained 24 hours a day.

The plant treats a sewage which at times is preponderantly industrial and, in spite of concentration variations running as high as 3000 ppm. and as low as 60 ppm. of suspended solids, as well as wide ranges of B.O.D., the plant continues to operate with good efficiency.

Average analyses in 1943 were as follows:

	Raw Sewage	Effluent
Susp. Sol.	250 ppm.	50 ppm.
B.O.D.	210 ppm.	100 ppm.
pH	7.68	7.29

Using 8.2 lb. of lime and 1.9 lb. of ferric chloride per hundred lb. of dry solids for sludge conditioning, the yield of the vacuum filter averaged 4.7 lb. per square ft. per hour.

Mr. Louis P. Booz, Consulting Engineer of Perth Amboy, discussed Mr. Oliver's paper, commenting on the general applicability of this particular design for sewages laden with industrial wastes.

*Chairman of the Program Committee which deserves high credit for producing an outstanding program.

The benefits of sewage treatment at Perth Amboy include the reclamation of mud flats, formerly a stinking mess. Elimination of the sewage made it possible to construct a sea wall, fill in the flats and develop a park. A board walk, beach, tennis courts, and skating rink are popular with all ages. Sewage treatment in Perth Amboy has, thereby, been of more benefit than the clearing up of the polluted water-way alone.

Sewage Treatment on a Potable Water Shed

Richard E. Bonyun, Gen. Supt., Passaic Valley Water Commission, Paterson, N. J., in commenting on the relation of sewage treatment to water supply, directed attention to the existing New Jersey laws for the control of pollution of water sheds. Operating under this law the Passaic Valley Commission which has two sources of supply, the main one of which is the Passaic River, maintains a water shed patrol utilizing two inspectors. Comprising some 770 sq. miles of water shed, the area is heavily populated, contains a number of cities and many large industrial establishments.

The water shed patrol samples all sewage plant effluents, and all wastes discharged from industries direct to the river, as well as the river itself at many locations. These samples are analyzed in the Water Commission Laboratories and must meet certain minimum standards for effluents as follows:

1. No free acidity or alkalinity.
2. pH between 4.3 and 8.2.
3. No toxic substances
4. Freedom from color and turbidity effect 1,000 ft. below the discharge into the stream.
5. No odors.
6. No floating solids.
7. Not more than 20 per cent of 1 ml. samples may show the presence of coliform bacteria.
8. Less than 60 p.p.m. B.O.D for an average of any four hour samples.
9. Less than 80 p.p.m. B.O.D. in any single sample.

In general, according to Mr. Bonyun, sewage plant effluents conform to these minimum requirements; but the Commission prefers to see chlorination of sewage practiced as an added safeguard. Water utilities, sewage plants, and industry must cooperate to protect the water supply of a community.

In discussing Mr. Bonyun's paper, W. C. Mallelieu, San. Engr., Jersey City Water Dept., and Supt. Sewage Treatment at Boonton, N. J., offered the following generalizations: The problems of today are the problems of domestic sewage and industrial waste combined.—Freedom of disease today is only an armistice, a complete victory over disease is yet to be won.—There will be additional public health problems after the war.—Small sewage treatment plants should be combined with larger plants to produce better control of operation.

In specific comment on the relation of sewage treatment to water shed control, Mr. Mallelieu suggested that the control of sewage plant operation should be from the standpoint of the effect on the receiving body of water, rather than based on an effluent standard. Such control should be, in his opinion, predicated on the following concepts of stream condition.

"There should be no increase in coliform bacteria content below the plant outlet.—The D.O. below the outlet should not be reduced below 5½ ppm. and the B.O.D. of the effluent, obviously, should not be high enough to reduce the D.O. below the outlet to less than the 5½ ppm.—The pH of the stream should remain between 6.2 and 7.6.—There should be no unsightliness in the stream and no deposited sludge banks.—Chlorine for protection should be added at least one-half hour before discharge of the effluent.—Laboratory control should be utilized to determine whether or not these standards are met.—All tests should be made according to 'Standard Methods' and monthly reports should be submitted to the controlling authority."

The obvious difference between these two points of view, as to standards for controlling water supply pollution, lies in the source of sample to which standards are applied. Inasmuch as different receiving bodies of water have different capacities to receive pollution without undue effect, it is apparent that the control of the effect on the receiving body of water constitutes a less rigid criteria of proper operation. Control of the effluent to specific limits may, in some cases, produce overemphasis on the "purity" of the effluent, and necessitate a degree of treatment not warranted. The degree of treatment may be varied seasonally to take full advantage of stream conditions.

Mr. Bonyun expressed the belief that the two attitudes toward standards might be happily combined, and still allow for some of the flexibility which Mr. Mallelieu favors.

"Here and There" During the Meeting

Entertainment
A view, in part, of the E. J. M. S. C. S. H. Orchestra from the Elizabeth Treatment Plant

"Blue Print Now!"
Post-war Planning Panel in action—Chairman Enslow at the "Mike"

Attendance
Constituting a record for all but the nationally attended Silver Anniversary meeting.

Exhibits
A corner in "Art" Clark's attractively arranged exhibit hall. Exhibitors are listed at the end of this report.

Postwar and Advance Planning

In opening the afternoon symposium on Post War Planning, the chairman, Linn H. Enslow, Editor, *Water Works and Sewerage*, called attention to the keynote of the session as given on the front cover of the program to wit: **"An Association serving the field through two world wars and again looking forward, planning for peace."** "This attitude of the N. J. Assoc.," said Mr. Enslow, "is exemplified by the scheduling of this symposium in an effort to consider all aspects of the problems of advance post-war planning; who starts it, who pays for it, how it is sold to the public, what part industry plays in it, and what part the engineer plays in it."

In introducing E. L. Filby, Field Director, of the Committee on Water and Sewerage Works Development, Mr. Enslow pointed out that Mr.

Filby had now traveled over 30,000 miles and had been in nearly every state in the Union, bringing the message of "Blueprint Now" to water and sewage associations and water and sewage authorities in general.

"Blueprint NOW — Who Starts It?" "You do," says Mr. Filby, "or if you don't, it doesn't get started." It is the operators, who know the needs of sewage treatment, or water purification. It is the operators who must convince the municipalities and industries to join in solving particular problems. But the operator can enlist the help of state health departments, or salesmen, to obtain those ideas on paper as a starting point for advance planning.

There are now 80,000 men returning each month from the war. Some provision must be made for jobs for those men, if not immediately, certainly after the war. Construction of public works, far from being a boon-doggle, offers an outlet not only for men in the construction field but also for factory workers who fabricate the equipment which goes into water and sewage plants.

It has been shown that construction of sewage disposal plants can be gotten under way faster than any other type of public works construction. Therefore it behooves men in the sewage treatment plants, or men where sewage plants are needed, to put their ideas on paper and have a program ready to go at the earliest possible time after the war.

"What is the problem?" In setting up any program it is essential to consider the problem and analyze it as to local and regional needs. Specific needs as to sanitation construction or improvement should be cataloged as to priority of need. Good water supply and sewers have made American cities what they are, and no one should let the public shrug off the needs of a community in that respect.

A survey of thirty-three cities indicates that 72 per cent of them expect or need some addition, or revision and improvement in their sewerage system and disposal plants after the war. New Jersey could do no worse than follow suit in preparation for post-war construction by planning now; for New Jersey's problems of unemployment will be exceeded only in seven states. New Jersey may expect to absorb 609,000 unemployed or 38.8 per cent of the total employment in 1940.

Post-War Panel

E. T. Killam, Consulting Engr., New York — *C. W. Paulus, Mayor, New Brunswick, N. J.* — *E. L. Filby, W. & S. Devel. Committee, New York* — *W. R. Darby, Comm. Dept. Local Govt., Trenton* — *F. D. Livermore, Mayor, Ridgewood, N. J.*

P-W. Panel Chairman
Linn Enslow, Editor W. W. & S., New York

Federation Secy.-Editor
Homer Wisely, Urbana, Ill.

In closing Mr. Filby said, "Public Works construction is the bridge that will span the unemployment chasm of conversion from war to peace."

Mr. Enslow commented that it was to be hoped that planning would not lag and thereby create a deadline rush such as occurred in the last surge of public works construction developed to create employment.

As to the **"Financial Aspect of Post War Planning,"** Hon. Walter R. Darby, Commissioner, Dept. of Local Govt., State of New Jersey, said that his topic was certainly not the least important. Pointing out that legal debt limits could, in N. J., be sidetracked if the State Dept. of Health ordered the construction of a sewage treatment plant as a matter of public health, Mr. Darby intimated that many cities had extended themselves in the matter of sewage treatment and had constructed plants above their ability to pay for in operation, maintenance and debt retirement. Mr. Darby further suggested that in some cases, because of pride, or the desire to be better than their neighbors, or because some engineer wanted it, plants had actually contained unnecessary equipment or equipment costing more than its worth to operate and maintain.

Mr. Darby suggested that financing be considered first and that the ability of the community to build, operate and amortize the debt should be the governing factor as to the size and completeness of the plant. Extensions and extra features should be left until later. Mr. Darby compared some of these smaller cities to

Programmers

P. J. Kelley, Limestone Prod. Corp., Newton, N. J. — *R. E. Bonyun, Genl. Supt. Passaic Valley Water Comm., Paterson, N. J.* — *A. B. Kozma, Supt. Treatment Wks., Rutherford, N. J.* — *R. L. Carr, Tech. Div. Mathieson Alk. Wks., New York* — *J. K. Adams, Supt. Treatment Wks., Tenefly, N. J.* — *D. Carmichael, Boro. Engr. Supt. Sewage, Verona, N. J* — *R. Ockerhausen, Tech. Div. Gen'l Chem. Co., New York*

the man who had a "Ford income but tried to run a Cadillac car."

While Mr. Darby's plea for sound financing was acceptable to the audience his implications that cities had over-extended themselves, or designing engineers had over-designed, was a theme which received considerable opposition and criticism, both from the members of the panel and the audience.

Mr. Enslow emphasized the fact that, prior to the past decade, sewage plants were generally under-built rather than over-built. Such overbuilding as occurred in the past ten years may have been the result of the easy money policy of the federal government; however, engineers had experienced the fallacy of trying to cut the cloth to too close a fit in previous years, only to find the plant overloaded within but brief time after its completion. Sanitary engineers were generally agreed that sewage treatment had not been on the plane of those "gold plated valves" as implied by Mr. Darby.

In answer to a question from the floor, Mr. Darby said there was no provision in New Jersey for any post-war planning financial assistance by the state to municipalities such as had been developed in New York, Michigan and proposed in other states.

Mr. Filby then told of several states where plans were in existence to help finance the actual development of plans for post-war work. And Mr. Filby further pointed out that financing of the construction of these post-war projects should *not* be planned to depend on Federal funds. There was absolutely no evidence that Federal "handouts" were to be repeated in these times of ability of municipalities to pay their own way.

Another questioner wanted to know if the state of New Jersey had a Sewer Rental Law. Mr. Darby said, "No," but there was a provision that, if the utility is self supporting, twenty times the income collected can be deducted from the bonded indebtedness limit of the city. Mr. Darby expressed surprise that revenue bonds seem to be more in demand by bond houses than are general municipal bonds. Certainly the latter were to be preferred in so far as safety of principal and interest was concerned. This attitude likewise was contrary to the majority of opinions expressed by members of the audience who, by virtue of experience, have seen the decided benefits of revenue bonds and sewer rental systems. Mr. Enslow closed the discussion with the comment that the N. J. method is in effect a revenue bond system, but has the advantage that it creates an incentive on the part of the local authorities to make operation of the plant self-supporting, and thereby benefit by the ability to issue more general bonds.

"Selling Postwar Planning to the Local Taxpayer and Governing Body" apparently is not difficult if one proceeds according to the ideas of Hon. Frank D. Livermore, Mayor of Ridgewood, N. J., and Assemblymen, State of New Jersey. Mr. Livermore, in an informal presentation, told sewage works men how to sell

A Prideful Proclaimer

Took the form of this herald which stood forth in red lettering on the blue cover of the 29th annual program of America's Oldest Sewage Works Association.

[Ed. Note: The question has been raised if the N. J. Association is not likewise the "World's Oldest Sewage Works Assn." While we believe it is, we need more proof than is available at the moment.]

the post-war planning idea as well as why to sell it. A practicing engineer, Mayor Livermore knows the problems from both sides of the picture and, from the time he began to talk until he finished, it was obvious that New Jersey operators and plant managers were receiving some of the best advice and suggestions they had ever heard.

It is quite probable that some bonds will have to be issued in order to get started, but this should be no deterrent. All plans should be predicated on the idea that the municipality will do its own financing and not depend on the federal government. Dependence on Federal help means that often the work can not be done without governmental interference. "But remember," said Mayor Livermore, "post-war plants are not just to take up the post-war slack; they are needed for the future as well."

"What do you do for money?" Get it now, set up a capital fund during the present times in order to provide for the future. And "who do you tell about your needed improvements?" "Don't tell each other, tell your community. Make contact with your community officials, and tell the public in general as well."

One of the best ways to sell one's ideas to the community officials and the public is to keep one's plant clean, and invite officials, organizations, clubs, and individuals to visit the plant. Invite the representatives of the press, expend a modest amount of money and plenty of elbow grease, and make it evident that the plant is working to the best of its ability. A well kept plant is evidence that the operator knows what his business is and, therefore, knows when he needs improvements or expansions. This was the straight-from-the-shoulder advice of a mayor.

"The Trend of Industry and its Effect on the Future of Sewage Treatment," according to Hon. Chester W. Paulus, Mayor of New Brunswick, N. J., is toward participation of industry in payment for sewage treatment costs; for industrial waste treatment will be a big problem after the war.

The presence of industrial waste in New Brunswick sewage, particularly wastes of exceptionally high strength, made it necessary to consider ways and means of handling the problem. Three possible plans were available; first, require industry to establish independent treatment plants; secondly, require industry to pre-treat wastes before discharge to the sewers; or, lastly, accept all wastes into the city sewers for treatment by the city.

The first plan would be the easiest way out for the city but would put an undue burden on the industry, because the concentrated wastes are harder to treat; and additional land and equipment would be required at the industrial site, neither of which might be easy to obtain at the present time. Likewise there was the cost of operating the individual treatment plants to consider.

The second plan is not practical at New Brunswick, and would prove uneconomical because of the additional solids load caused by chemical pretreatment of the industrial wastes.

The third plan has a number of advantages. Its total cost to industry is less. Present city sewage plant capacity is almost adequate. Some plants could not discharge elsewhere than to the sewers. Some wastes are no problem when diluted or mixed with other neutralizing wastes.

On the other hand, disadvantages of the third plan include the increased load on the treatment plant, the increased cost of solids disposal, the increased cost of chlorination, and the need for some additional equipment.

The obvious answer was to apply special charges for industrial wastes, and so an ordinance was passed setting up these charges based on three items: (1) flow; (2) suspended sol-

J. "Ken" Adams
Supt. Treatment
Teneffy, N. J.
and
Arthur Lehmann
Supt. Treatment
Hackensack, N. J.

Fred. Menzenhauer
W. & T. Co.
Newark, N. J.
and
Sol. Seid
Supt. Treatment
New Brunswick, N. J.

Chas. M. Krassy
Supt. of Water
Manville, N. J.
and
"Mike" S. Kachorsky
Supt. Public Wks.
Manville, N. J.

"Ed." B. Shiddell
Electro-Rustproofing Co.
Dayton, Ohio
and
"Dick" Ockerhausen
Tech. Div.
Gen'l Chemical Co.
New York

ids content; (3) chlorine demand. These charges are $22 for each million gallons of flow, $5 for each ton of solids, and $5 for each 100 lb. of chlorine demand. Where the charge is more than $1000 per year, a meter is required on the sewage. For charges less than $1000 per year, the water consumption is taken as the flow. Analyses to determine the solids and chlorine demand load are made by the laboratory of the sewage treatment plant.

There is also a provision that industry must bear its share of capital expenditure for any new units required to handle the total industrial load.

In reply to a question as to whether New Brunswick was the first city to use such a system of charges, Mayor Paulus referred to an article in the March issue of *Water Works and Sewerage* by Symons and Crane—"Special Sewer Service Charges for Industrial Waste" at Buffalo, N. Y., where these special charges were inaugurated on Feb. 1, 1943.

"The Consulting Engineer in Advanced Planning" has a definite place, according to Ellson T. Killam, Cons. Engr., New York City. That place is to make investigations, develop adequate data, and prepare plans of sufficiently long term character; but plans that can, if necessary, be translated into imminent construction and future additions or amplification. Piecemeal planning is uneconomical, where piecemeal construction from adequate projected plans is not. Fifteen years is not long in retrospect and should be the lower limit of future plans.

Above all, plans should be started now in order to avoid the deadline type of planning of the past 10 years. First it was deadline planning to obtain P.W.A. money; more recently it was deadline planning to meet the war effort goal. While the latter resulted in time saving, it did not result in good plans nor the most economical planning or construction in many cases. To start planning now is to give ample time for thorough investigations and good sound planning when engineers have men available for such work.

Trustee
John Struss
Supt.
Dept. of Sewerage
N. Wildwood, N. J.

Chief
Harry P. Croft
Chief Engr.
State Dept. Health
Trenton, N. J.

R. C. Beckett, State San. Engr. of Delaware, called attention to the present need for developing reserves. "We must prevent inflation and we must see that money is available to match the equipment when it becomes available." A few additional comments by Mr. Filby and a general summing up of the session by Mr. Enslow completed the symposium, which had maintained a record audience throughout the afternoon.

Manufacturers' Dinner and Entertainment

In these days of rationing one expects—and receives—chicken for dinner. But one does not expect the entertainment to consist of orchestral music furnished by a seven-piece orchestra, the members of which are all employees of a sewage treatment plant. Not several plants, but all from one plant. No amateurs these; all of them had had twenty years or more of professional experience as musicians, and all of them (one ringer was filling in on trumpet for the Plant Supt. now in the San. Corps) are employed at the Joint Meeting Sewage Treatment plant at Elizabeth, N. J.

Of course there was another group of musicians (three) and a singer, to give background music for the magician (also good); but it was the "Elizabeth, N. J., Joint Meeting Sewage Treatment Plant Semi-Classical Silver Horn Orchestra" that stole the show. With Ed. Decher, Acting Chief Engineer, batonning the group and doubling as a drummer in a piano and drum duet, a variety of jazz, swing, martial, classical, and just ordinary singing music, really entertained the customers. Here's a "Be-

"Dan" Jerman
and
"Dan" Atwell
Pittsburgh Eq.
Meter Co.
New York

Earl "Shorty" Germond
and
"Ken" Van Brunt
W. & T. Co.
Newark, N. J.

John Hood
Supt. of Sewerage
and
Rex. Whittemore
Ch. Operator
Ridgewood, N. J.

Henry Landesman
Chief Engr.
and
Jas. C. Long
Chief Operator
N. J. State Hosp.
Greystone Pk., N. J.

lieve It or Not" for Ripley, a band in a sewage plant.

Effect of War on Chemicals Used in Sewage Plants

Speaking about filter alum, Richard Ockershausen, Tech. Div., General Chem. Co., told the story of wartime filter alum; why it came into being, why it differed from other alum, how much impurity it contained, and how it had been improved since first put on the market.

Magic and Music

On left and right a pretty clever magician is at work. On one end he charms "Carrie the Cobra"; on the other he is proving to a certain editor that the hand is quicker than the camera as well as the eye. The orchestra is Ed. Decher's "Elizabeth Joint Meeting Sewage Treatment Plant Semi-Classical Silver Horn Orchestra"—the name being longer than the clarinet.

Victory Alum came into being because of the increased needs of the aeroplane industry for good bauxite ores; because the submarine sinkings markedly reduced the import of good South American ores; and because the Canadian aluminum production increased tremendously, requiring much of the better ores from the United States. Production of aluminum could not utilize poorer grade bauxite ores and, although public health uses of aluminum ores for alum were given second priority, it was necessary to use high silica ores for this latter purpose.

The effects of the war on filter alum are illustrated in the following table:

Constituent	AWWA Stds.	Victory Alum Stds.	Avg. Anal. (10 sources)
Al_2O_3	17.0% min.	14.0% min.	15.6%
Fe_2O_3	0.75% max.	3.0% max.	0.34%
Insol	9.5 % max.	15.0% max.	6.08%

Mr. Ockershausen referred to a symposium held at the Penn. Water Works Operators Meeting in Harrisburg, Pa., in June 1943 (see report on this meeting in *Water Works and Sewerage*, July 1943) and said that several operators at that meeting had at that time reserved final opinion on the use of "Victory Alum" but had agreed that it was as good or better than the pre-war filter alum. True, there were some difficulties in solution feed caused by settling of impurities, but more attention to grinding and particle size had decreased this objection. Operators' ideas on handling the material have generally helped in improving the situation.

In answer to questions Mr. Ockershausen quoted from the Harrisburg meeting, saying that in general no more, and often less, Victory alum was needed than had been previously used. In clear waters it appears that less of the high insolubles alum is needed, and in no case was more than 10 per cent additional alum required. Sewage not being a clear liquid it is possible that some additional alum might be needed to effect coagulation; but it has been observed that, with the poorer grade alum, operators are giving more attention to control with the net result that often less alum is used than heretofore.

Ralph L. Carr, Technical Division, Mathieson Alkali Works discussed the impact of the war on chlorine manufactures. There has been no change in the purity of the chlorine but the quantity available for some industries has had to be curtailed. The exception to this has been the sanitary field. In answer to a question Mr. Carr stated, however, that, because of the amount of chlorine now going into hypochlorites for water treatment in far-flung areas around the earth, there is no excess supply for the sanitary field and use of chlorine for odor control and the like perhaps may continue to be limited.

Biggest difficulty has been the shortage of chlorine cylinders. The large number needed and stored by the army at various military establishments materially reduced the number of cylinders available for the water and sewage field. Some 20 to 25 per cent of the total cylinders have been lost to circulation because army posts or other plants have not returned cylinders when empty. Mr. Carr urged that everyone continue to return empty cylinders as soon as possible.

Francis Burr, Technical Division, Monsanto Chemical Co., spoke on the coagulant "Ferrisul." Prior to the war, 65 per cent of the manufacturing capacity went to water, sewage, and boiler water treatment. Now most of the capacity goes into war industries. In later months priorities became equal and it was possible for water and sewage plants to obtain the chemical more easily. It was found out that the amounts of ferric sulphate needed in processing synthetic rubber and cartridges was less than had been anticipated so there is once more plenty of Ferrisul for water and sewage treatment.

Inasmuch as Ferrisul requires a corrosion resistant mixing pot and agitator, and inasmuch as stainless

W. R. Lafferty
Supt.
Dept. Sewerage
Lakeland,
N. J.

George H. Boone
Supt. Sewerage
Morristown, Pa.
and
Raymond G. Case
Supt. Sewerage
Merchantville, N. J.

Luncheon to Special Guests, Speakers and Officers of the Associations

Eugene B. Swindheart
Supt. of Treatment
Pottstown, Pa.
and
Dave Carmichael
Boro Engineer
Verona, N. J.

Geo. Andersen
Supt. of Sewerage
Rockville Center,
L. I.

steel had been found to be best, the Monsanto Chem. Co. obtained an allotment of stainless steel which has since largely gone to replace parts of agitators in water plants where replacement was needed.

I. M. Glace, Cons. Engr., Harrisburg, Pa. — *Paul Hiller, Innis, Speiden Co., New York* — *L. A. West, Major, San. Corps, Carlisle, Pa.* — *Robt. S. Shaw, State Dept. Health, Trenton* — *H. J. Meeker, Div. Mgr., Worthington, Harrison, N. J.*

In the absence of Harry C. Bixler, Asst. to the President of Limestone Products Corp., "Pete" Kelly of this same company read a paper on the subject of limestone products. Describing the process of sampling, blasting, mining, crushing, picking, sizing, conveying, storage, and calcining of the limestone, the paper pointed out that there had been little effect on the production of lime except in the matter of maintenance of equipment and manpower. Proper maintenance has been maintained with no loss in purity of the product. Loss of manpower to the army has meant curtailment of capacity by about 40 per cent and there is not expected to be any improvement in this matter for the duration.

Symposium on Sludge

Under the leadership of John Duane, Supt. Bergenfield-Dumont Joint Meeting, the matter of sludge disposal was presented in four papers and a summary covering several aspects of the subject.

This symposium by operators of the No. Jersey Section of the Association had been well prepared. As a matter of fact a dress rehearsal had been held some time previously, at which each participating member had read his paper for timing. Overlapping comment had thus been eliminated and the presentation in general made more smooth.

"Collection and Pumping" of sludge from all types of tanks was the topic covered by David Carmichael, Boro Engineer and Supt. Sewage Treatment, Verona, N. J. Main points stressed by Mr. Carmichael are included in the following: With hydraulic removal pump often for short periods particularly if the line contains many bends and fittings.—Don't let raw sludge become septic.

Mfrs.' Assn. Officers

Arthur T. Clark, Secy.-Manager W. & S. Mfgrs. Assn., New York — *Frank Lovett*, Sales Engineer, Link-Belt Co., Chicago*

(*During the Trenton meeting the Executive Committee of the Sewage Wks. Div. of the Water and Sewage Wks. Mfgrs. Assn. elected Mr. Lovett Vice-Chairman of the Committee.)

—When considering pumping schedules and practice consider also the viscosity of the sludge, a property which varies with temperature and agitation.—Install plenty of valves and safety devices.—Gravity removal of sludge has distinct limitations.—Sludge pumping is often the focal point of operation of a plant.—Everything benefits by more frequent pumping, sludge is less septic, less water is pumped with the sludge, pumps operate better and so forth.

"Digestion, Operation and Control," by A. B. Kozma, Supt. of the Rutherford Joint Meeting, opened with the statement that proper collection of sludge reduced the problems of digester operation by 50 per cent.

Mr. Kozma's paper included comments on all phases of sludge digestion including design, maintenance, operation, and control. Some of the points covered were these: Tank capacity should be 2 c.f./cap for plain sedimentation, 3 c.f./cap for complete trickling filter treatment and 4 c.f./cap for activated sludge.—In the matter of heating, provide 1 sq. ft. of heating coil area for each 100 c.f. of tank volume.—Types of tanks may be two story (Imhoff), fixed or floating cover, single or multi-stage, with or without mixers.—Purpose of digesters is to reduce the volume of sludge solids and also their nuisance value, i.e. volatile content.—Optimum temperatures are above 80-85 degrees F.—Gas production should be equivalent to approximately 1 cu. ft. of gas per cap. per day, or 10-15 cu. ft. of gas per lb. of volatile matter destroyed.—Increase in the CO_2 content of the gas presages trouble some time in advance.—Volatile acids also rise with approaching trouble.—The ratio of free CO_2 to total alkalinity is a measure of tank condition.—Acids may be controlled by liming.

The use of ammonium sulphate for scum control is still very definitely in the realm of experiment.—Removal of solids is simple if to covered beds or filters, but not so to open beds.—Methane gas when mixed with air is explosive in the

"Ambassadors of Commerce"

Chicago Pump Co.'s

"Alex." Baynes, New York

"Steve" Whitby, Philadelphia

"Stan" Koppe, Washington

Builders—Omega

Carl Perkins, Philadelphia

"Rollie" Leveque, Sales Mgr. Omega, Kansas City

Winfield Codell, New York

Chain Belt Co.'s

"Jo." Roberts, New York

Carlton Lind, Milwaukee

"Bob" Steindorf, Milwaukee

Johns Manville's

"Low" Frazza, Newark

"Jimmie" Walker, Mgr. Transite Pipe Div., New York

range between 1 to 5 and 1 to 12 parts of methane to air.—Digestion of garbage gives gas higher in carbon dioxide content.—To obtain best results from a heating boiler keep the temperature at 180 degrees and cut water temperature back to 140 deg. for the heating coils.—Two ideas for starting tanks exist, first fill the tank with sewage and heat, adding sludge when the tank reaches operating temperature, or add sludge to tank directly without any sewage, and heat up as sludge is added. Some operators prefer one method, some the other.

Mr. Kozma closed with the statement that sludge digestion continues to be one of the most important phases of sewage treatment plant operation.

"De-watering" was the topic presented by John K. Adams, Supt. sewage Treatment Plant, Tenefly, N. J. The purpose of dewatering is to further reduce the volume of the sludge. This is generally done on sand beds. Sand bed dewatering can be improved as to length of drying time by the addition of alum coagulant. Such treatment is not effective on sludges with a solids content of more than 8 or 9 per cent. Iron coagulants tend to plug the sand of the drying bed.

Mechanical dewatering is generally less economical in small plants. Centrifuges and presses have proved unsatisfactory. Elutriation promises to be one of the most valuable aids to de-watering yet proposed. Now in operation at 12 plants, elutriation reduces chemical dosage, increases cloth life, and reduces the time usually required for digestion.

Best results for sludge dewatering on vacuum filters are obtained when the sludge is concentrated, filters are operated continuously, conditioning agents are properly controlled, and quick mixing is obtained.

One desirable but not yet obtainable feature is a quicker and simpler method of winding cloth on filters. Use of rope, saran, wood or other means have been tried for holding cloth on the filters, but none of them completely solves the problem. Acid washing of filter cloths and filters has proved effective in at least two plants. For raw sludge, Minneapolis has found that a filter rate of 2 lb. per sq. ft. per hr. is more economical than higher rates. This should have some effect on future design of vacuum filters.

"Disposal of Sludge and Supernatant" is important, according to George Eckert, Supt., Sewage Treatment Plant, Hasbrouck Heights, N. J. There must be provided an economical method of disposing of sludge without nuisance. These methods have ranged from trenching and filling to drying beds and lagoons. Application of sludge as a fertilizer is recommended by Mr. Eckert and he referred to an article on "Fertility of Sludge by Rudolfs in the Reference and Data Section of the June 1943 issue of *Water Works and Sewerage* as a source of valuable information on this subject.

As to supernatant liquor disposal, Mr. Eckert remarked that if not handled properly it could cause considerable difficulty. Best insurance against troubles from supernatant liquor is to return it at a constant rate to the raw sewage. Adding it to the influent of aeration tanks, particularly in "slugs" may be quite upsetting. Adding supernatant liquor ahead of chlorination increases the demand. If the liquor is high in solids the demand may be quite high and "slugs" will upset the dosage control.

"Discussion" of the above phases of sludge handling was given by Dr. H. Heukelakian, Associate, N. J. Experiment Station, New Brunswick, N. J. Speaking from a somewhat academic attitude, Dr. Heukelakian said that there are at least three reasons for the frequent removal of sludge from settling tanks, and thoroughness of removal should be assured but under no circumstance should too much water be taken with the sludge.

Use of thickeners (concentrators) to reduce the water content of sludges before pumping to digesters has many advantages. Compacting of sludge will take place at normal temperatures but not so well below 40 deg. Compacting of sludge to too great a degree is not advisable because it adds difficulties to pumping, and interferes with proper digestion in the tank.

Dr. Heukelakian commented on two stage digestion, mentioning that whereas it had been thought that the liquefaction stage was of longer duration than the gassification stage, studies had shown that if it is desired to accelerate digestion it will be necessary to accelerate both stages. The intermediate reactions that exist are not understood. Researchers wonder if these reactions can be directed to improve digestion. Dr. Heukelakian does not believe the use of ammonium sulphate is the answer to scum problems, basing his contention on the fact that digesting sludge abounds in ammonium salts already.

In the matter of sludge drying, evaporation is important, drainage accounting for only a part of the decrease in moisture. Drainage is at a uniform rate, evaporation depends on temperature, air currents and cracking. Rain effects depend on the length of time the sludge has been drying. There are three periods in the drying period when rain effects differ. Rain on fresh drawn sludge apparently does not affect the drainage. When the sludge has been thoroughly drained but before evaporation starts, rain likewise has little effect, but after evaporation has practically been completed rain will be reabsorbed.

Supernatant liquor should be considered normal if it has the following characteristics:

Susp. Solids	1000-2000 ppm.
B.O.D.	1000-2000 ppm.
Vol. Acids	2000-3000 ppm

Dr. Heukelakian commented on the aeration system which has shown a marked improvement in reducing the B.O.D. and suspended solids of supernatant liquor of the above characteristics. The speaker said he will be interested in the observable effects of this aeration treatment on supernatant liquor of high solids and high B.O.D. Reducing the temperature of supernatant liquor aids in separation of solids.

In the discussion period which followed the symposium considerable comment was directed to the effects of aerating and to chlorinating supernatant liquor before returning it to the activated sludge process.

Exhibitors' Hall

During the entire meeting the exhibitors' hall was open, with twenty-one booths.

Among the exhibitors were the following:

American City Magazine.
American Well Works.
Ralph B. Carter Co.
Chain Belt Co.
Chicago Pump Co.
The Dorr Co.
Electro Rust-Proofing Corp.
Engineering News-Record.
Fairbanks, Morse & Co.
Flexible Sewer Rod Equipment Co.
Johns-Manville.
Limestone Products Co. of America.
Link-Belt Co.
Pacific Flush Tank Co.
Pittsburgh Equitable Meter Co.
Public Works.
Royer Foundry & Machine Co.
Sewage Works Engineering.
Wailes Dove-Hermiston Corp.
Wallace & Tiernan Co., Inc.
Water Works & Sewerage.

THREE YEARS' OPERATION OF THE GARY INDIANA, ACTIVATED SLUDGE PLANT

With a Discussion of the Effects of Iron Wastes on the Process and Plant Operation

By L. R. HOWSON and W. W. MATHEWS
Designing Engineer, ALVORD, BURDICK & HOWSON, CHICAGO, ILL.
Superintendent, SANITARY DISTRICT OF GARY, IND.

OPERATION of the Gary, Indiana, activated sludge plant started in the fall of 1940, so that at the close of 1943 records of operating results were available for three calendar years. Gary, famous for its steel industries, is unique with respect to sewage treatment, in that there is only one noticeable industrial waste discharged into the sewer system. This is the spent acid containing ferrous sulphate resulting from the steel pickling process.

Authors
Howson and Mathews

Volume of Iron Wastes Increased During War

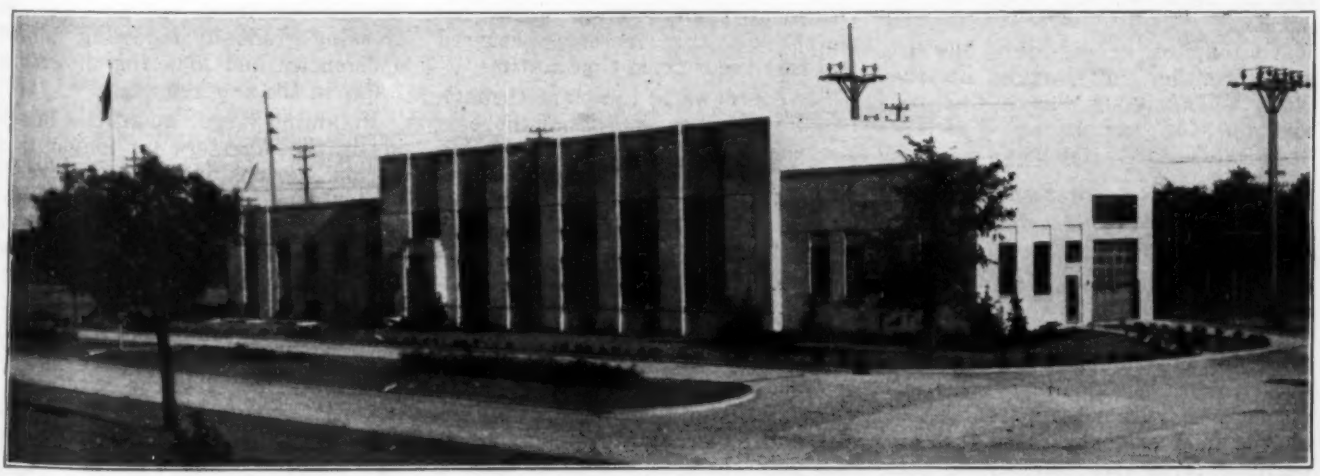
During the past three years, due to wartime production, the Gary plant has operated with an increasing pickling liquor load being 351,000 gallons in 1941, 509,000 in 1942, and 672,000 in 1943. The pounds of iron discharged to the sewer increased still more, viz., from 250,000 pounds in 1941 to 500,722 pounds in 1942 and 695,323 pounds in 1943. The 1943 average iron content of the sewage was equivalent to 10.62 p.p.m. (90 pounds per mil. gal), an increase of 138 per cent in two years. (Table 1.) Since November 15, 1942, this waste has been neutralized with lime. In addition to the ferrous sulphate, cutting oil has been discharged into the sewers at intervals, so that the effect of the two wastes on the treatment process is now familiar to the operating staff at the Gary plant.

Although there has been some increase in population during the past three years, no attempt has been made to estimate this increase since men entering the armed services have probably kept the total connected at about the same level.

The efficiencies noted for suspended solids reduction and 5-day B.O.D. removal are computed on an annual basis, i.e., total pounds of each entering and leaving the plant over an entire year. It is interesting to note that it was possible to obtain the efficiencies shown for 1943 with the plant on primary treatment only, due to clogged diffuser tubes, from March 15th to April 5th.

TABLE I
Summary of Operating Results, Activated Sludge Treatment Plant, Gary, Ind.

Item	1941	1942	1943
Population Served (Estimated)	100,000	100,000	100,000
Total Sewage Pumped, m.g.	7,074	7,563	7,847
Average Daily Pumpage, m.g.	19.37	20.72	21.50
Total Suspended Solids Removed, Lb.	11,657,667	14,011,858	19,074,538
Total 5-Day B.O.D. Removed, Lb.	8,276,834	7,927,967	7,869,441
Gas Production, Cu. Ft.	53,320,100	57,594,800	52,430,600
Average Daily Gas Production	146,156	157,790	143,660
Total Air Blown, Millions C.F.	3,351,394	3,329,188	2,954,181
Reduction in Suspended Solids, %	96.12	97.22	96.58
Reduction in 5-Day B.O.D., %	94.31	94.72	93.50
Cost of Operation			
Per Million Gallons	$9.42	$8.79	$8.70
Per Capita (100,000 Connected)	0.6482	0.6652	0.6827
Per 1,000 lbs. 5-Day B.O.D. Removed	7.83	8.39	8.67



The Main Building, Gary Sewage Treatment Plant
Houses Offices, Laboratories, Pump and Blower Rooms

Blower Room

In the foreground—three motor-driven Elliott Centrifugal Blowers. In the background—two Roots-Connersville Rotary Blowers direct-driven by two 300 H.P. Cooper-Bessemer Engines driven by digester gas. Total air capacity 35,000 cfm.

Sludge Bulking no Problem at Gary

Summing up the operating experiences of the past three years, it is somewhat out of the ordinary to note that to date no bulking has occurred except on one occasion. This was induced as an experiment by reducing the air blown until the D.O. at the end of aeration was down to 0.4 p.p.m.

No foaming of digesters has occurred, either in starting up the plant when seeded sludge was not available, or in placing digesters back into service after being cleaned.

Wide Variations in Supernatant Solids Do Not Affect Plant Efficiencies

Supernatants from the digesters which mix with the raw sewage have not upset the treatment process. Loadings on the plant have varied greatly with the quality of the supernatants, with no apparent effect on the final effluent. Since this experience is in such contrast to that encountered at similar plants, the writers feel that this deserves special mention. Examination of Table II, "Suspended Solids and 5-Day B.O.D.", shows that there was a marked increase during the last 6 months of 1943 in the strength of the sewage as indicated by the 5-Day B.O.D. and suspended solids. There are several factors entering into this increase. A brief description of the layout of the intercepting sewers and treatment plant follows, which explains how this increase occurred and may recur from time to time.

Sewage flows to the plant through two interceptors, one from the east about 3.1 miles in length and varying in size from 72 to 84 inches in diameter and one from the west about one mile in length, 42 inches in diameter. These sewers discharge into a junction chamber just ahead of the comminutor pit and suction conduit. The supernatants from the digesters flow by gravity into the 42 inch sewer 500 to 1000 feet west of the junction chamber. The mixture of raw sewage and supernatants is pumped to the grit chamber where sewage is first sampled and these samples are designated as raw sewage. While this labeling is not exactly correct as to classification, because of the mixing noted above, it indicates total load on the plant and treatment process. In the latter part of 1943, due to lack of personnel, some illness and men changing jobs, and necessity of maintaining mechanical equipment, it was not possible to drain digesters to the drying beds as often as usual. At the same time the flow was decreasing gradually following rainfall deficiencies and lowering of ground water in the sewered areas.

Retaining larger quantities of solids in the digesters for longer than normal periods increased the solids contents of the supernatants materially and this, in combination with the decreased flow, gave the marked increase in suspended solids and 5-Day B.O.D. noted above. Under normal operating conditions with sludge being drained to the dewatering beds at regular intervals the effect of the supernatants on the strength of the sewage is negligible. This will average about 1 p.p.m. for 5-day B.O.D. and 5 p.p.m. for suspended solids. This was computed over a 9-month

TABLE II

SUSPENDED SOLIDS AND 5-DAY B.O.D.

Months 1943	Sewage Flow M.G.D.	Suspended Solids: Raw Sewage p.p.m.	Suspended Solids: Primary Effluent p.p.m.	Suspended Solids: % Rem. Clar./ Raw	Suspended Solids: Sec. Effluent p.p.m.	Suspended Solids: % Rem. Complete treat.	5-Day B.O.D.: Raw Sewage p.p.m.	5-Day B.O.D.: Primary Effluent p.p.m.	5-Day B.O.D.: % Rem. Clar./ Raw	5-Day B.O.D.: Sec. Effluent p.p.m.	5-Day B.O.D.: % Rem. Complete treat.
Jan.	22.70	296.6	103.6	65.01	7.2	97.56	134.0	76.3	43.48	7.9	94.10
Feb.	22.42	314.3	135.9	56.76	7.0	97.77	113.8	74.7	34.17	4.8	95.81
Mar.	23.00	223.9	99.9	55.38	{ 6.3* { 56.06†	98.07x	92.8	63.2	31.96	{ 4.0* { 34.17†	96.79x
Apr.	23.69	178.0	84.9	52.33	{ 6.9* { 18.75†	96.42x	104.5	64.3	38.49	{ 6.2* { 17.05†	94.43x
May	24.95	187.9	67.0	64.39	4.2	97.75	72.8	36.0	50.49	4.2	94.47
June	21.57	229.8	71.3	68.98	3.3	98.56	89.3	46.7	47.69	8.1	90.93
July	20.42	328.7	104.0	68.36	3.3	99.08	114.1	60.6	46.89	5.7	95.03
Aug.	22.92	316.7	81.0	74.41	2.8	99.12	118.9	50.6	57.45	7.6	93.59
Sept.	20.83	292.2	84.2	71.16	3.5	98.82	187.0	65.0	65.25	4.8	97.46
Oct.	20.20	418.7	97.7	76.22	3.4	99.12	176.3	75.7	57.08	5.4	96.95
Nov.	18.45	491.7	110.1	70.47	3.8	99.22	193.8	68.1	64.85	3.3	98.30
Dec.	16.80	462.8	125.3	72.85	5.0	98.93	209.3	93.6	55.27	4.5	97.84
Average	21.50	301.61	95.39	68.37	10.34**	96.58**	129.46	63.25	51.15	9.29**	92.82**
Max.	24.95	491.7	135.9	76.22	7.2	99.22	209.3	93.60	65.25	8.1	98.30
Min.	16.80	178.0	67.0	52.33	2.8	.....	72.8	36.0	31.96	3.3	90.93

**Includes 21 days primary treatment only.
*With complete treatment.
†Weighted for primary and complete treatment.
xEfficiency while on complete treatment.
Note: Operating on primary treatment only March 16-31 and April 1-5 inclusive.

period of normal draining of digesters when the 5-day B.O.D. in the raw sewage averaged 154 p.p.m. and the suspended solids 202 p.p.m. Correcting for supernatants over the year 1943 changes the lb./cap./day B.O.D. of the plant influent from 0.23 to 0.20. Since the average 5-day B.O.D. of the mixture of raw sewage and supernatants for the last four months of 1943 was 0.30 lb./cap./day, the effect of the supernatants in imposing an extra load on the treatment process is clearly shown.

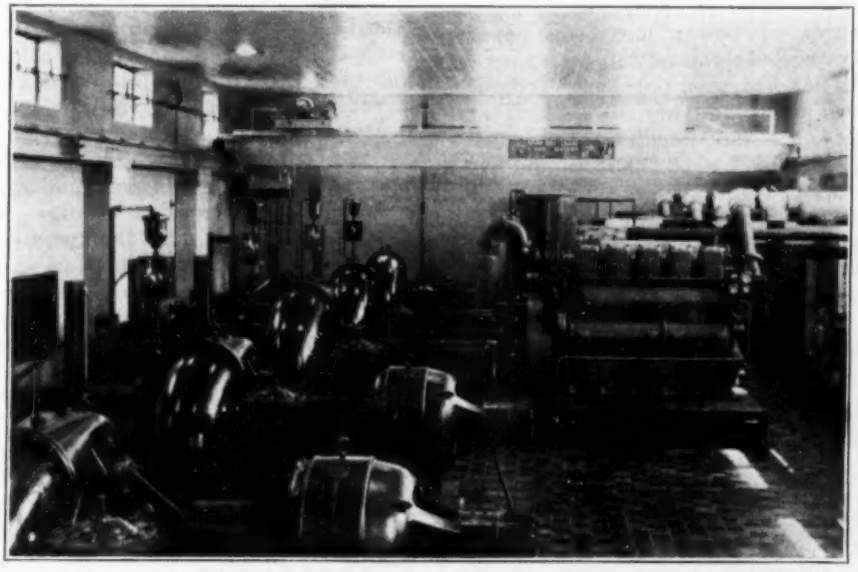
The interesting fact brought out by the above conditions is the ability of the plant and treatment process to absorb the extra load. During the four months noted, total air blown increased from 8.67 mcf/day in September to 8.83 mcf/day in November and December, or approximately 2 per cent. The increase shown in c.f./gal. is due to the decrease in sewage volume. At the same time the load of 5-day B.O.D. in the raw sewage mixture increased from 430,116 lb. in September to 544,580 lb. in December, or approximately 26 per cent. P.p.m. of 5-day B.O.D. in the final effluent ranged between the limits of 3.3 and 5.4, September to December inclusive, with suspended solids almost parallel between 3.4 and 5.0 p.p.m. It should be particularly noted that the .30 lb./cap./day B.O.D. of the sewage being treated in the period covered above is nearly double the .167 lb./cap./day carried in what is sometimes referred to as average sewage. Further, on numerous days, the total pounds of suspended solids in the supernatants equalled, or has exceeded, those in the sewage flowing to the plant, although the 5-day B.O.D. does not rise proportionately when this occurs.

Rainfall Affects Infiltration and Sewage Strength at Gary

Due to a combination of drought from September to December, 1943, inclusive, with a rainfall of 4.24 inches compared to 10.27 inches normal, and with more solids than usual in the supernatants, the suspended solids and 5-Day B.O.D. in the sewage during the latter part of 1943 have been consistently higher than heretofore. In wet periods, when the ground water is above the level of the sewers at Gary, infiltration accounts for about 50 per cent of the flow, and total sewage flow at these times is approximately 200 per cent of the water works pumpage. Total flow in December averaged 16.80 m.g.d. with a water works pumpage of 10.1 m.g.d. This flow is the lowest monthly average experienced in the past two years. Practically all of the city is built on a subsoil of lake sand, which accounts for the high rate of infiltration. Operating experience here indicates that a certain amount of diluting water is beneficial to the activated sludge process. Since the average time required for sewage to reach the plant is about four hours, the sewage treated is fresh, plus the benefit received from ground water dilution, and perhaps in a measure to the fine silt entering through the leaks into the sewers.

Large Volume Gas Production Effects Economics in Operation

Gas production has been higher over the three year period than would normally be expected with a sewage concentration similar to that



Pump Room

In the foreground—two 15 mgd. motor-driven Worthington pumps. Beyond —three 175 H.P. Worthington digester gas-driven engines direct connected to three 20 mgd. Worthington pumps. Total capacity 90 mgd.

TABLE III
AIR CONSUMPTION

Months	Air Millions Cu. Ft. per Day	Air Cu. Ft. per Gal. of Sewage	D.O. at End of Aeration p.p.m.	D.O. in Final Effluent p.p.m.	Lbs. B.O.D. Removed per 1,000 Cu. Ft. of Air	Cu. Ft. of Air per Lb. B.O.D. Removed	Per Cent of Air Blown with Sludge Gas
Jan.	8.86	0.40	5.3	8.5	1.45	690	99.95
Feb.	8.77	0.41	7.9	9.0	1.49	668	100.00
Mar.	8.46*	0.46	8.6	8.9	1.36	734	99.07
April	8.47**	0.36	8.4	8.0	1.32	757	96.09
May	8.06	0.30	8.6	8.0	1.04	965	77.80
June	8.33	0.39	6.9	7.3	0.84	1195	99.52
July	8.28	0.41	7.1	8.3	1.13	883	100.00
Aug.	8.56	0.38	8.6	9.7	0.94	1022	100.00
Sept.	8.67	0.42	9.6	9.0	1.18	847	99.80
Oct.	8.81	0.44	8.2	9.9	1.34	793	100.00
Nov.	8.83	0.48	8.8	9.5	1.13	885	99.09
Dec.	8.83	0.53	7.3	9.7	1.41	707	99.54
Average	8.59	0.41	7.9	8.8	1.20	836	97.61
Maximum	8.86	0.53	9.6	9.9	1.49	1195	100.00
Minimum	8.06	0.30	5.3	7.3	0.84	668	77.80

*For 15 days complete treatment.

**For 25 days complete treatment.

at Gary. The lowest annual gas production in the past three years was in 1943, when the daily average was 1.44 c.f. per cap per day. It is possible that the ferrous sulphate wastes, through coagulation and flocculation, help to precipitate and remove solids that would otherwise flow out of the plant in the final effluent. The liberal design of digesters to provide capacity for future digestion of ground garbage, i.e., 6 c.f. per capita for 170,000 population, permits of longer sludge retention and probably helps to raise the gas yield per capita or per pound of volatile solids.

The result of sewer flushing during storms slows down gas production for a few or several days, depending upon the severity of the storm. Cutting and fuel oil, which has found its way into the sewer system at intervals, causes material decreases in gas production and for a short period of time as much as 50 per cent. The pickling liquor obviously has no deleterious effect on gas production.

The value of the sludge gas as a source of power has been demonstrated over the past three years. If the gas had been purchased from the local utility during 1941, 1942 and 1943, the additional cost would have been $20,877.66, $22,535.80 and $20,946.44. The decrease in value of gas produced during 1943 was due to the excessive rainfall the first part of the year which very materially reduced gas production.

Low Air Requirements

Air requirements have been low throughout the three years. For the period 1941 to 1943 inclusive, 0.52, 0.46 and 0.41 c.f. per gal. was blown. (Table III.) Even with this low air consumption, the D.O. at the end of aeration and in the final effluent is somewhat higher than is considered necessary for good operation. (Table III.) It would appear at Gary that using slightly more air than is required will slow down clogging of the diffuser tubes and permit keeping one set of aerators in service longer than would be the case with less air. Experiments along this line are still being carried on.

Returned Sludge

It was discovered shortly after the plant was placed in operation that a 25 per cent rate of return was not high enough to prevent deterioration of the sludge in the secondary clarifiers. Normally an average rate of return of about 35 per cent is maintained, and at times this may be increased to 40 per cent or more. A lower rate may be used at times, due to certain return sludge pumps being down for maintenance, but otherwise the higher rate prevails.

Grit Removal

Quantity of grit removed is well above the totals of most sewage treatment plants. With practically all sewers laid in fine lake sand of about .1 mm. effective size, and with infiltration continuous, grit removal, even in dry weather, is high. In December, 1943, when the precipitation was only 0.13 inches, total grit removed was 12.54 c.f. per mil. gal. In December, 1942, the total was 12.57 c.f. per mil. gal., which is high to date. The lake sand is so fine and buoyant that operation routine is now to keep both grit chambers in service, although the collector and conveyor mechanisms are not operated continuously. Before this was done, considerable fine sand was found in the digesters on cleaning. In 1941, the average grit removed in the grit chambers was only 3.51 c.f. per mil. gal., compared to 8.78 and 8.73 c.f. per mil. gal. in 1942 and 1943 with slower grit chamber velocities.

Effect of Pickling Liquor on Operation

Due to the topography and location of the industries in Gary, only a small proportion of the industrial wastes reaches the sewer system. The Grand Calumet River extends across the north portion of the city, with practically all the steel industries located between the river and Lake Michigan. The flow of the river is from east to west and consists mainly of cooling and condenser water from the mills amounting to approximately 450 mil. gal. per day. The river is the only natural drainage outlet for about the north half of the entire city. Only one industry, which is south of the river, discharges any industrial waste into the sewer system. This is ferrous sulphate from the pickling process.

There are three pickling tubs at this industry which have capacities of 2,000, 3,000 and 6,000 gallons, which are dumped at irregular intervals of from one to five days. The largest amount of liquor which has been discharged in one day is 8,000 gallons. The war program has shortened the intervals between dumpings.

In 1941, the first calendar year of operation, the pickling liquor did not seem to have any harmful effect on the treatment process except from iron clogging the diffuser tubes, which necessitated cleaning at intervals. Treatment results indicated that the plant was functioning properly. Then, during the latter part of 1942 it became evident that something out of the ordinary was apparently changing the strength of the sewage as indicated by the lower 5-day B.O.D. On the basis of a slight increase in population tributary to the plant, there should have been an increase in the 5-day B.O.D. The contrary was taking place. Where, in 1941, the average 5-day B.O.D. in the raw sewage was 158, this had decreased in some instances to as low as 53 p.p.m., with the final effluent carrying at times 22 p.p.m., where normally a high of about 10 p.p.m. would be expected. No changes had been made in the treatment rou-

tine. The sludge index was very irregular with monthly averages ranging from 69 to 125, covering the period from May to October. This period was selected because it is six months prior to neutralizing the acidic iron wastes with lime.

A study of all factors entering into the problem finally indicated that the increase in the quantity of pickling liquor was causing the trouble. For the six months' period noted above, in 1941, the average gallons dumped per month were 29,500 with acidity of 5.2 per cent and 8.8 per cent iron. In 1942, this had increased to an average of 46,300 gallons per month (increase 57½ per cent) with acidity of 7.1 per cent (increase 36½ per cent) and iron per cent of 9.9 (increase 12.5 per cent). No treatment was given the ferrous sulphate except diluting with water used to wash out the various pickling tubs.

The problem was discussed with Dr. Willem Rudolfs at the Cleveland convention in October, 1942. He stated that the low pH in the sewage,—this dropped from 7.1 to 6.1 on days that iron was received,—was slowing up biological phenomena to a point that in five days the B.O.D. determination did not give a true indication of the strength of the sewage. Also, with the pH in the mixed liquor changing from alkaline to acid and back again at short intervals, the biological process was inhibited. He recommended neutralizing the ferrous sulphate with lime so that the pH would not drop below 6.5 in the raw sewage, and to set up B.O.D. samples for both 5 and 20 days on those days when the ferrous sulphate wastes were discharged into the sewers. Dr. Rudolfs also advised that by the end of 20 days the inhibiting effect of the wastes would have been overcome, providing the pH was kept above 6.5 and that this determination would be correct. It would then be a simple matter to compute the theoretical B.O.D.'s at 5, 10 and 15 days and plot curves so that comparison could be made with the 5-day determinations of the raw and clarified sewage.

Through cooperation of the industry, neutralization was effected and is still being carried on. With the use of lime, the pH in the raw sewages averages 6.7 and 6.8. To make the comparisons more definite, samples were set up for 10 and 15 day periods, as well as for 5 and 20 days. After numerous determinations on raw and clarified sewages and with various size tubs dumped, it was found that apparently the size of the tub made little difference in regard to the factor required to raise the 5-day B.O.D. as determined, to the actual B.O.D. A table of the amount of lime required for neutralization was furnished the industry for the several tubs and for various percentages of acidity. It was found that a constant of 1.4 had to be applied to 5-day B.O.D. determinations to get a true indication of the strength of the raw and clarified sewages.

A typical curve for raw sewage is shown on the diagram (Fig. 1) for a day on which the 6,000 gallon tub was dumped, but since this is for a single determination, the variation between the actual determined 5-day and theoretical B.O.D. is not exactly 1.4. (See Fig. 1.) When the 6,000 gallon tub is dumped in one hour with a flow of 20 mil. gal. which is the average pumping rate, the slug of waste mixed with sewage enters the primary clarifiers with a concentration of iron of slightly over 800 p.p.m.

The neutralization with lime has given more uniform and better treatment results. This is not only indicated by the B.O.D. in the final effluent, which has averaged 4.2 to 8.1 p.p.m. for the six month period, May to October, 1943, but the sludge index has stayed within the comparatively narrow range of from 64.8 to 77.2. These figures are monthly averages.

Effect of Iron Wastes on Clogging of Diffuser Tubes

While the treatment process functions satisfactorily with neutralization, there is still another problem confronting the operator handling pickling liquor. That is the clogging of the plates or diffusers in the aera-

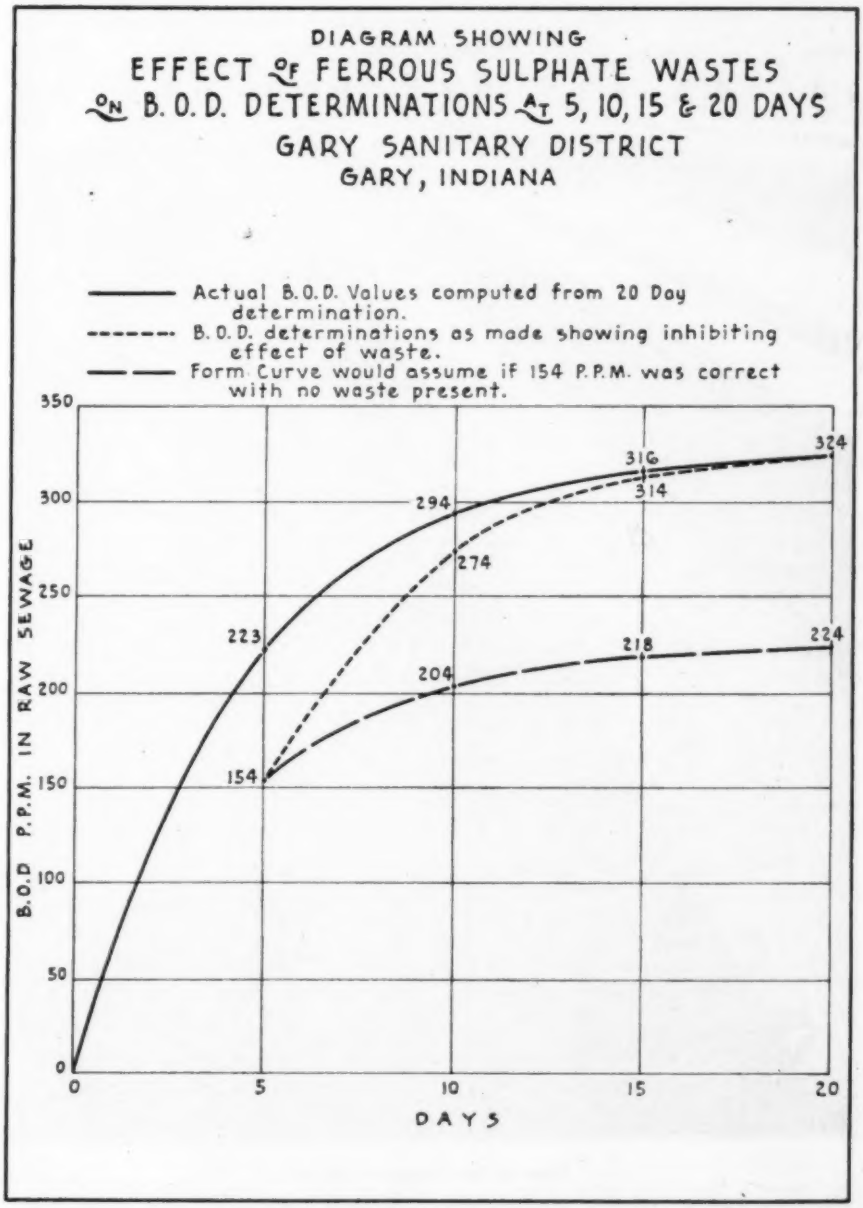


Fig. 1—Diagram Revealing Effects of Acidic Iron Pickling Liquors on the B.O.D. Test.

TABLE IV
AERATION DATA

Months	Sewage* Flow Through Aerators M.G.D.	Sludge Recirculated Per Cent by Volume	Sludge Diverted to Primaries Per Cent Col. (2)	Aeration Period in Hours	Blower Pressure Lbs./Sq. In.	Secondary Settling Period in Hours	Secondary Settling Rate Gals./sq. Ft.
Jan.	28.89	30.60	2.50	4.07	7.8	2.78	772
Feb.	28.77	33.56	3.80	4.18	7.7	2.84	768
Mar.	24.64**	31.30	4.10	4.87	7.7	3.32	658
April	28.49***	29.23	2.95	3.37	7.7	2.87	761
May	30.10	25.00	2.99	3.38	7.8	2.72	804
June	27.51	30.42	3.66	4.25	7.9	2.97	735
July	27.47	35.81	4.66	3.49	7.8	2.98	734
Aug.	29.83	33.50	4.85	3.39	7.5	2.14	814
Sept.	27.81	34.73	5.89	4.27	7.5	2.88	756
Oct.	26.47	32.55	5.96	3.63	7.7	3.08	710
Nov.	25.33	38.09	4.50	3.86	7.8	3.22	678
Dec.	23.00	37.02	4.85	4.03	7.9	3.56	614
Average	27.36	32.49	4.27	3.90	7.7	2.95	734
Maximum	30.10	38.09	5.96	4.87	7.9	3.56	814
Minimum	23.00	25.00	2.50	3.39	7.5	2.14	614

*Includes recirculated sludge. **Complete treatment 15 days only. ***Complete treatment 25 days only.

tors. There are so many variables entering into this problem, such as concentration of wastes when dumped, dilution in the sewer system, location of industry with respect to the treatment plant, amount of air blown per minute per square foot of tube or plate, pressures applied to tubes, that probably no single remedy will effect a cure in all cases.

One of the Aeration Units

Showing easily removed and serviced "Aloxite" diffuser tubes staggered well above the floor. To check cloggage from deposition of iron oxide these tubes are "painted" with thinned petrolatum or vaseline after cleaning.

At Gary we have been experimenting with slightly higher blower speeds with a corresponding rise in the air blown per minute. After cleaning tubes, they are greased with petrolatum which we find tends to prevent clogging. This grease is heated in a bucket until it has the consistency of about No. 10 motor oil and is applied to the tubes with a paint brush.

On July 27, 1943, four clean aerators were placed in service, one of which was not greased. This was aerator No. 7. The initial starting pressure was 7.1 pounds per square inch. On August 25th, a fifth aerator was added on account of pressure build-up to 8.2 pounds per square inch. Pressure immediately dropped back to 7.4 pounds per square inch. During this interval No. 7 aerator lost the spiral flow almost entirely and it was apparent that the solids were settling out in the aerator. At the effluent weir, very few solids were flowing to the secondary clarifiers. Just as an experiment, No. 7 aerator was kept in service until September 28th, when it became evident from the few bubbles appearing at the surface, and the almost entire lack of spiral motion, that this tank was a liability rather than an asset as far as the treatment process was concerned. It was drained at this time and found to be septic, although not to such an extent that any effect was noticeable in the final effluent.

From that date four aerators were continued in service until December 10th, when another was added on account of pressure build-up to 8.2 pounds per square inch. This reduced the pressure to 7.7 pounds per square inch. On January 25, 1944, the pressure had again built up to 8.2 pounds per square inch and three clean aerators with the last one cut into ser-

vice were placed in operation. Pressure dropped to 7.3 pounds per square inch and cleaning of clogged diffuser tubes started.

The longest period we have been able to operate one set of aerators without cleaning tubes has been 13 months and the shortest period 2 weeks. If aeration is interrupted for any reason, for from one-half to one hour, a quick build-up in pressure results. This same trouble with clogging due to shut-downs, has been experienced at one other plant with which we are familiar, and where iron is not present. It is usually possible there, however, to get back to the original pressure after two or three months' operation without cleaning. That has not been the case at Gary. A build-up after a shutdown usually necessitates going on clean aerators and cleaning those previously in service. Cleaning costs about $100 per aerator basin in 1 mil. gal. capacity; (224 diffuser tubes) three to four days are required to clean a basin, depending on force available for this work and the condition of diffuser tubes.

One precaution taken is to divert the returned sludge from the aerators to the primary clarifiers during the period when the pickling liquor is reaching the plant. This is accomplished through cooperation of the industry in reporting the time a tub is being dumped. It takes on the average four and one-half hours for the waste to reach the plant,—a distance of approximately five miles. Diversion to the primaries is started four hours after time of dumping and the return sludge then mixes with the raw sewage between the grit chambers and the primary clarifiers. The combination of the return sludge solids and the iron, which has flocculated by the time it reaches the plant, gives a high percentage of reduction in suspended solids in the primary clarifiers, which, at times, has reached 95 percent. This tends to materially lower the amount of iron, which would ordinarily pass on to the aerators.

Aeration Efficiency

Picturing the evenness of air distribution even at low aeration rates through the staggered tubular diffusers.

Effect of Ferrous Sulphate Wastes on the Gary Activated Sludge Plant

Considerable thought has been given to the stability of the activated sludge process at Gary. The sewage flowing to the plant on days with no wastes dumped has no unusual characteristics, with suspended solids averaging around the 200 p.p.m. and 5-day B.O.D. about 150. The iron wastes discharged into the sewers at intervals appears to be the only factor entering into the problem that may cause the sewage and solids to react differently to the treatment process than occurs at other plants. Observations at Gary with the treatment of sewage containing ferrous sulphate wastes indicate that advantages as well as disadvantages result from these wastes being present.

It is obvious that if the iron waste producing industry is located in a city where the sewage flow is so small that the iron wastes constitute a gross overload, the treatment process would be upset. In the case here considered, the industry dumps the tubs as quickly as possible and with the 6000 gallon tub, it requires about one hour to drain the tank. The dilution is about 1500 volumes of sewage

TABLE V

ACTIVATED SLUDGE DATA

Months	Mixed Liquor			Returned Sludge		
	Suspended Solids p.p.m.	Settleable Solids 30 Min.	Sludge* Index	Suspended Solids p.p.m.	Flow M.G.D.	M.G.D. Wasted to Primaries
Jan.	1977	630	313.1	6345	6.771	0.1695
Feb.	1514	265	174.9	4972	7.228	0.2748
Mar.	1308	135	103.3	4427	5.798**	0.2375**
April	1208	66	54.7	3891	6.874***	0.2030***
May	1247	88	70.9	5105	6.019	0.1800
June	1139	88	77.2	4044	6.417	0.2346
July	1207	80	66.5	3970	7.270	0.3385
Aug.	1072	77	72.0	3781	7.485	0.3636
Sept.	1188	77	64.8	4513	7.169	0.4222
Oct.	1056	81	77.0	3826	6.500	0.3874
Nov.	1545	121	78.1	4217	6.988	0.3143
Dec.	1774	117	65.9	5296	6.214	0.3015
Average	1353	152	101.5	4532	6.728	0.2856
Maximum	1977	630	313.1	6345	7.485	0.4222
Minimum	1056	66	54.7	3781	5.798	0.1695
Maximum Day	2664	910	489	9764	8.140	1.3750
Minimum Day	476	30	40	1184	3.309	0.1156

*By standard methods. **15 days complete treatment. ***25 days complete treatment.

to one of iron waste over the one hour period.

The location of the industry with respect to the sewage treatment plant is important. The further from the plant the better. The reactions that take place, with the waste being neutralized and then discharged in the sewer, and there mixing with the normal flow, can be compared to the preparation of water for rapid sand filtration. The mixing of the lime with the pickling liquor and agitation with a fire stream is comparable to rapid mixing. The flow down the sewer is similar to flocculation and coagulation, and when the sewage reaches the plant a good floc is visible in the raw sewage. The primary clarifiers, except for the darker color inherent with sewage treatment, have the appearance of coagulation basins, with a resulting high percentage of removal of suspended solids. If the flocculation and coagulation is not well advanced by the time the treatment plant is reached, a higher percentage of iron will be carried over to the aeration basins.

Neutralization, as explained heretofore, is necessary to prevent interference with the biological processes. Without neutralization it was impossible to operate the plant at its usual efficiencies.

Rate of discharge should be as uniform as possible. With the original layout at the industry in question, it is not possible to slow up the time of draining the various tubs. Wartime production requires that tubs be maintained in service with a minimum shut-down time. It would be preferable to have the wastes discharged continuously at a uniform rate and this could be accomplished with an additional tank equipped with a float controlled orifice so that a flow could be maintained 24 hours per day throughout the month. This change is not possible under present conditions, but is something to be considered after the war is over.

Iron has always been present in the Gary sewage since the plant started operation, so statements as to what might occur if it were not present would be assumptions only. We believe, however, that with the evidence at hand, iron wastes properly neutralized and with a sufficient time lapse between dumping and reaching the plant, will produce a more stable condition in the treatment process. The Gary experience also indicates that troubles caused by an industrial waste can at times be greatly minimized through cooperation of the industry.

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(1) L. R. Howson, "Sewage Treatment at Gary," Sewage Works Journal, November, 1939.
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(5) W. W. Mathews, "First Year of Operation of the Gary, Indiana, Sewage Treatment Plant," Sewage Works Journal, March, 1942.
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A Plea for Fair Play

(From a Small Town Operator)

It is not enough there is a war on and we cannot get the materials we need. And just when we learn to make it of wood, the government declares a shortage of lumber. And help just ain't. And the flow increases. And the boss says, "So what? It's up to you. Everybody's in the same fix." And so on and so forth. And as if that ain't enough, a certain national magazine has to make fun of our efforts in its annual review of progress in sewage treatment.

Would they say the oysters off Coney Island shut tight their shells and move out to sea? Would they say the effluent from the Buffalo plant is so "hot" it keeps the Niagara River from freezing? Would they say enemy submarines off the eastern seaboard get their bearings from the odoriferous emanation from certain well known so-called t r e a t m e n t works? Would they—but why go on? You know they would not.

But the little guy? What of him? He can't hit back. He cannot go to a convention and get up on the floor and demand life, liberty and freedom to all the smells he can create, however mild they may be.

Suppose he does cancel his subscription or resign from his association in protest. Does anyone notice anything unusual? They do not. They don't miss him except to say, "Good riddance of bad rubbish." (Not referring to his sewage, but to him.)

What if the steelhead salmon (see page 47, 3rd column, February issue of a well known and widely read magazine) do go by his plant on their way to cleaner waters? What if occasionally one gets lost and wanders up the effluent discharge stream and leaps into the clarifier, mistaking the weir for a dam, and proceeds to fight his way against the supernatant stream and finally climbs up into the secondary? What of it? Can we help it? Why the comment about holding its nose? Wouldn't you? Did you ever try it? Then you should talk.

Supposing we should—but let it pass. Some people wouldn't see the point. We should worry. We do. We are wounded, disappointed, hurt. We thought we were contributing to the advancement of science and we find all we are doing is to add to the gaiety of nations and our own ridicule. Some day we will think up a snappy comeback. When we do, we will tell you.

Salmon or no salmon. Fish ladder or aerator. We'll patent the darn thing for something or other some day.

Sludge to you.

BERNARD ROWNTREE.

Carmel, Calif.

H. T. Gidley Died Suddenly

Early in March, Henry T. Gidley, Treasurer and Superintendent of the Fairhaven, Mass., Water Co., died as a result of a heart attack. For the past thirty-one years, Mr. Gidley had been in charge of the Fairhaven Water Co. and was sixty-five years old at his death. A member of NEWWA for thirty years, and of AWWA for twenty years, Mr. Gidley had been active in all phases of municipal life in Fairhaven. He was educated at the Massachusetts Institute of Technology and was a civil engineer in Boston before becoming Superintendent of the Fairhaven Water Co. He leaves a widow, son, two daughters, and two grandchildren.

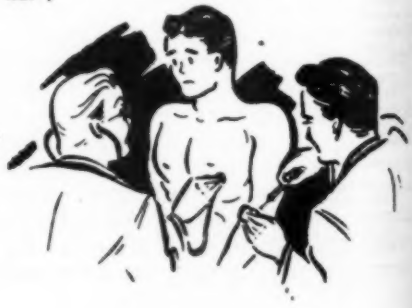
A Meter-Reader's Nightmare!

(Or Metered Hemoglobin)

Meter-Reader: Do I get in OK, "Doc"?

Army Doctor: Well, Son, aside from your blood being 99 per cent pure tap water, and your heart doing 400 nutations per minute, you are as normal as any other guy.

(From Pittsburgh Meter's "Water Journal")



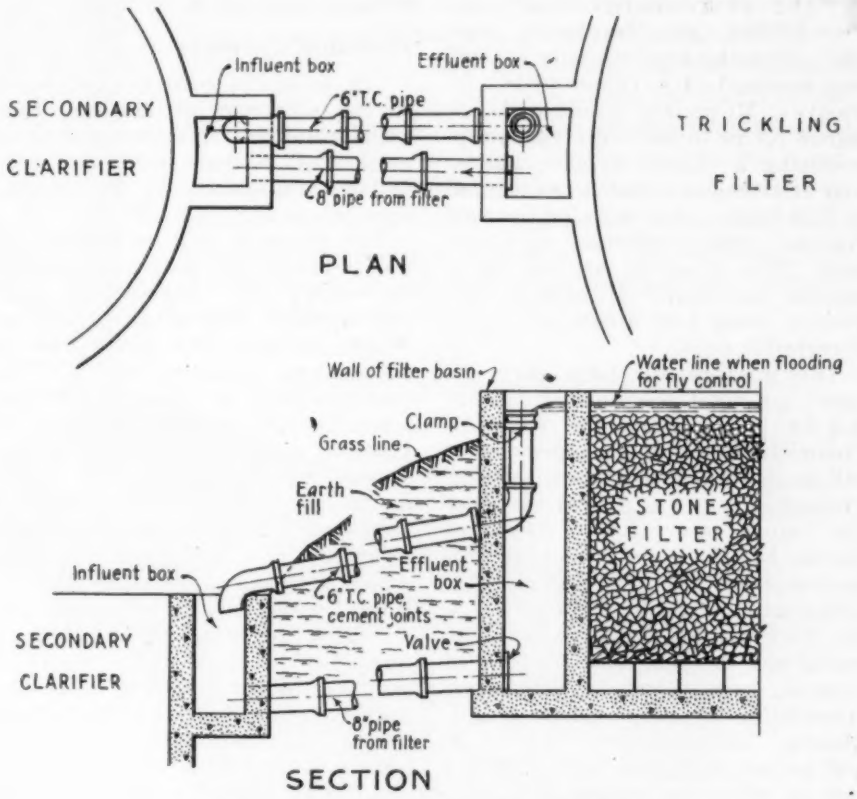
A SEWAGE PLANT KINK AND A GADGET

By BARTLEY J. CASH
Ass't Sup't
Dept. of Water and Sewage
NEWNAN, GA.

HERE are two ideas that have proved useful at the Newnan, Ga. sewage plant. Furthermore, they are ideas that fall within the category of "Build your own equipment" which the writer has previously presented, for these two were built by the author.

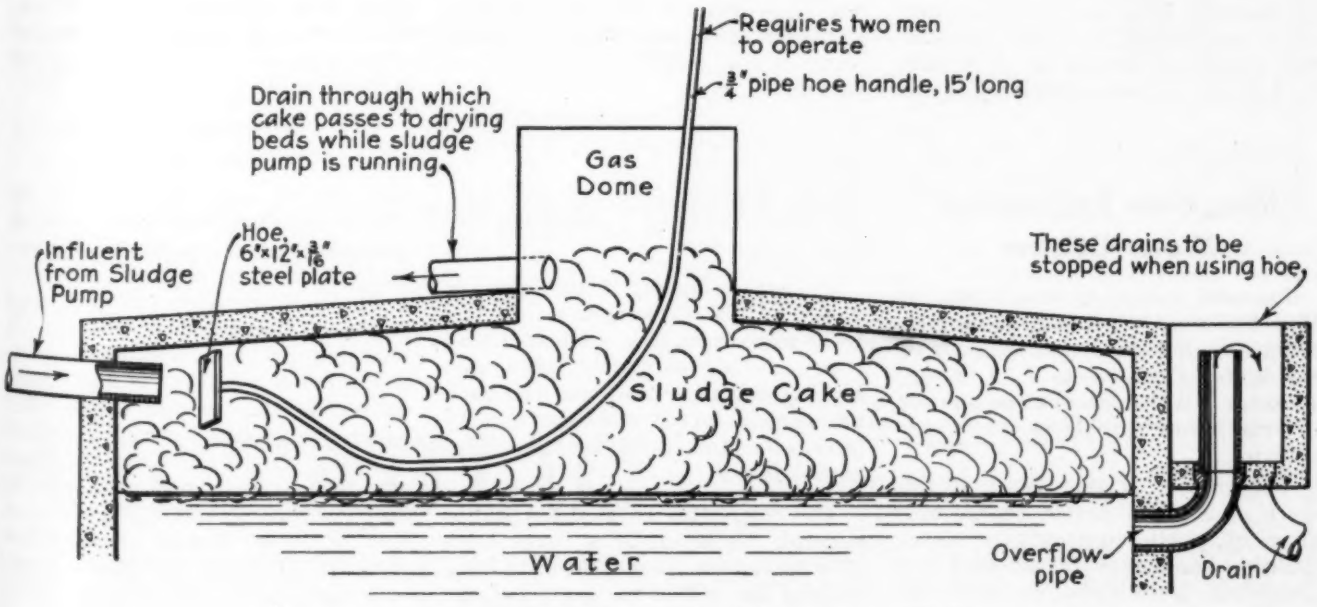
The first idea concerns an overflow pipe for the purpose of controlling water for psychoda fly control at a height just covering the rock in the trickling filter. By using this overflow pipe, it is possible to continue operating the filter without worrying about the flooded filter overflowing and running over the surrounding area, causing a mess as well as unwanted odor. Of course, it is not desirable to allow untreated sewage to pass on to the receiving stream, but this overflow is a safety factor in case the operator does not observe when the filter bed has become flooded.

The second of these ideas is a hoe designed to use in the top of a digester to remove the cake or scum that collects at the top. This scum is caused by motor oil and other things that will not digest, and its removal is desirable. By using the hoe, this scum cake may be passed out through the drain pipe to the drying beds. As shown in the sketch, the drain is located at the top of the digester. When operating the hoe, it is necessary to stop up the overflow drains in the effluent box and start the sludge pump. The discharge from the pump will help pass the scum out as it is pulled to the gas dome with the hoe.



Piping Arrangement for Filter Flooding.

This device will not be applicable to every design of digestion tank, but there are undoubtedly many places where some variation of the idea will find use.


Requires two men to operate
¾" pipe hoe handle, 15' long
Drain through which cake passes to drying beds while sludge pump is running
Gas Dome
Influent from Sludge Pump
Hoe, 6"×12"×3/16" steel plate
These drains to be stopped when using hoe
Sludge Cake
Water
Overflow pipe
Drain

Scum Removing Hoe for Digesters.

MILWAUKEE CONFERENCE LOOKS LIKE A "SELL-OUT"

PROGRAM and preparations for the 1944 Conference of the AWWA are developing rapidly. Although the meeting is still two months away (June 13-16, inclusive), Milwaukee hotels have assigned rooms to 950 individuals, representing a higher advance indication of attendance than was recorded at this time a year ago for the well attended 1943 Conference in Cleveland. This situation has led us to caption this item—"Milwaukee Conference Looks Like a Sell-Out"—and it certainly does.

This unexpectedly large early request for hotel accommodations has made it necessary for AWWA's Committee on Local Arrangements to call in the Milwaukee Association of Commerce to act as a clearing house for future reservations. Secretary Jordan has therefore issued the suggestion that those wishing hotel accommodations would fare better to file their request for type of accommodations desired, and number of persons, directly with the Milwaukee Association of Commerce (attn. A. J. Monroe) and save the time which will be lost in writing the several hotels at which conference attendants will be largely domiciled, namely, the Schroeder, Plankinton, Pfister, Wisconsin. Mr. Monroe will make the best reservation possible at one of these preferred hotels because of their facilities, rates and nearness to the City Auditorium in which all Technical Sessions are to be held and the Manufacturer's Exhibits located. Incidentally, because of the large advance application for exhibit space at Milwaukee the Committee on Exhibits has had to limit exhibitors to one booth space each. Already more than 90 firms have taken booths.

Technical Program

The technical sessions will begin on the afternoon of Monday, June 13th, permitting forenoon arrivals to get located in their hotels and comfortably registered for the conference before the sessions open.

The program will emphasize in-war problems and post-war planning for water supply. Representatives of the Office of War Utilities and its Water Division will participate in the sessions. A general review of the progress made in planning post-war water works construction will be made by a group of speakers. One session will be devoted to a review of the cost and life history of water works structures as well as an analysis of the Report on Depreciation which has been prepared by the National Association of Railroad and Utilities Commissioners. Management problems of water works in wartime will be reviewed by several speakers. The Water Purification Division will consider the most recent advances in control of chlorination and distribution systems. A review of new processes of reclaiming lime sludge from water softening plants will bring to light activity both in the United States and in England looking toward the reduction of the lime sludge disposal problem as well as the use of the lime deposited from the softened water as a treatment agent for water subsequently purified. The results from the nation-wide Water Conservation Program fostered by AWWA will be reviewed.

Social events will be again restricted in keeping with the times, as at Cleveland last year. There will be no scheduled golf tournament and no general excursions to places of interest. Provision is being made, however, for inspection of the various properties of the Milwaukee Water Works, limited to small groups who register for such inspections which will be arranged on definite schedules. There will be the usual opening reception and dance on Monday evening, a special evening program of outstanding speakers on Tuesday evening, and the Annual Dinner followed by dancing on Wednesday evening. During the afternoons the ladies attending will be suitably entertained, as in previous war-time conferences.

That AWWA's War-time Conferences are considered to be an important event for water works executives and employees holding key positions, is manifested by the heavy advance reservations. It is evident that the total registration in 1944 will be larger than for the past few years.

This in itself is evidence of the usefulness of these War-time Conferences on Water Supply and their value to the responsible executives and operators of America's Water Works.

Ed. Note: It is expected that the completed technical program will be ready for release and publication in our May issue, but in the meantime don't delay applying to the Milwaukee Ass'n of Commerce for hotel accommodations, if you haven't already secured such.

Manpower Problems of Water Utilities

Recently issued by the Office of War Utilities, WPB, a memorandum from Arthur E. Gorman, Director of the Water Division, to J. A. Krug, Director OWU, concerns the subject of manpower problems in water utilities.

This report is the result of the work of a committee of representatives of public and private water utilities who met in Washington last December. Questionnaires were sent to twenty-six municipal and three private water utility systems, representing a total population of 12,800,000.

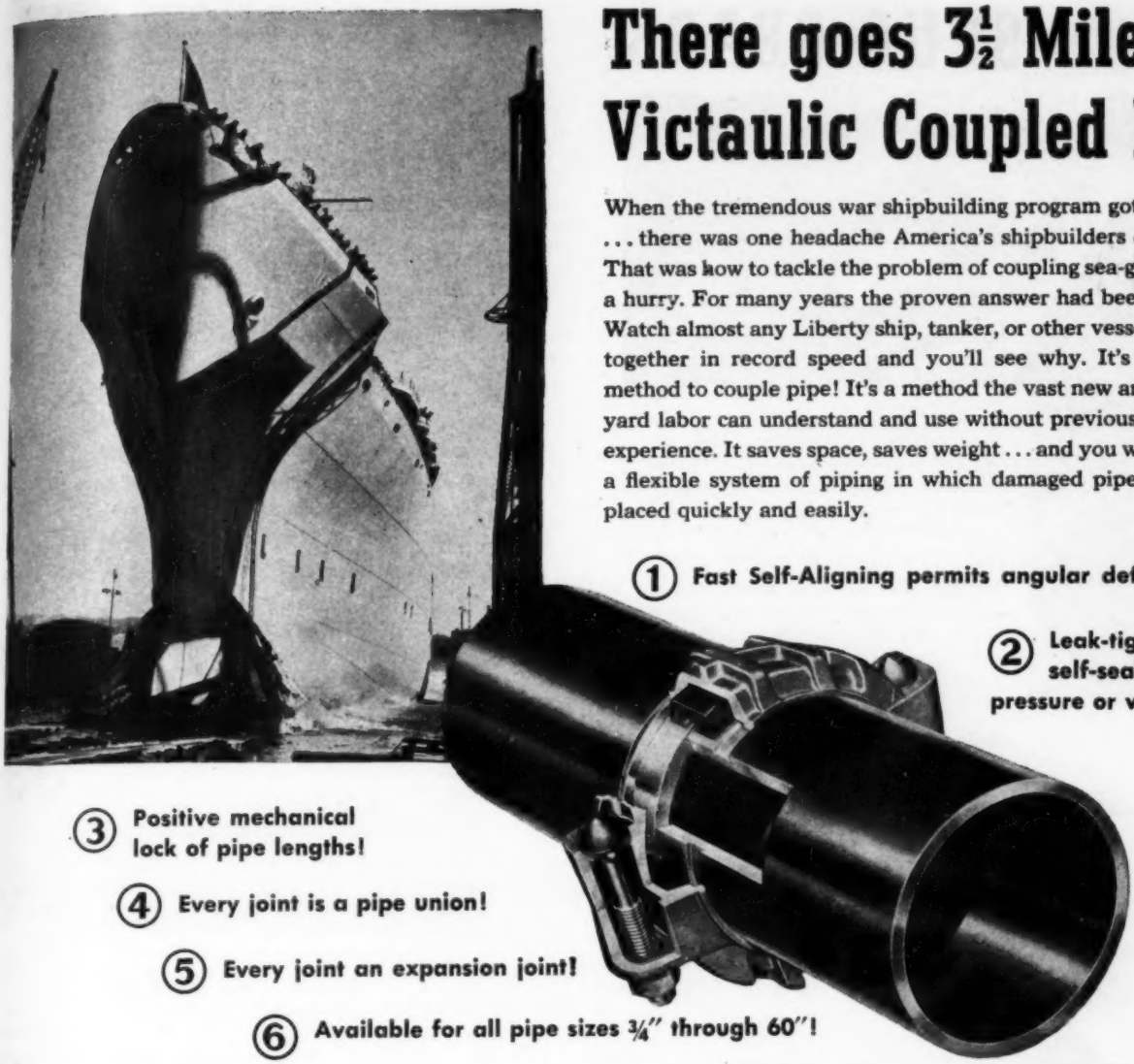
Of approximately 8,400 men in water utility organizations in the 18-38 age group, it is estimated that there are approximately 1,000 men holding essential positions who have not been deferred and who qualify physically for induction into the armed forces.

The committee concluded that, in general, water utilities have been able to replace employees who have entered the armed services; but the supply of key operating personnel is nevertheless now close to the absolute minimum, and men in essential positions have become increasingly difficult to replace.

The memorandum contains three pages of suggested procedures for handling problems related to selective service induction, including discussion of the basis of occupational deferments, how registrants are classified, how to proceed in obtaining occupational deferments, assistance through referral to Office of War Utilities, special consideration for employees listed as holding critical occupations, and information on the stabilization of employment.

There goes 3½ Miles of Victaulic Coupled Pipe

When the tremendous war shipbuilding program got under way ... there was one headache America's shipbuilders *didn't* have. That was how to tackle the problem of coupling sea-going pipe in a hurry. For many years the proven answer had been Victaulic. Watch almost any Liberty ship, tanker, or other vessel being put together in record speed and you'll see why. It's the fastest method to couple pipe! It's a method the vast new army of shipyard labor can understand and use without previous training or experience. It saves space, saves weight ... and you wind up with a flexible system of piping in which damaged pipe can be replaced quickly and easily.



(1) **Fast Self-Aligning permits angular deflection!**

(2) **Leak-tight, self-sealing under pressure or vacuum!**

(3) **Positive mechanical lock of pipe lengths!**

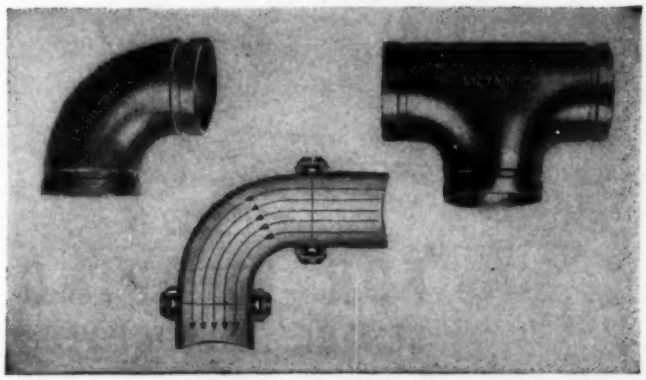
(4) **Every joint is a pipe union!**

(5) **Every joint an expansion joint!**

(6) **Available for all pipe sizes ¾″ through 60″!**

SPECIAL VICTAULIC ADVANTAGES IN THE FIELD OF PUBLIC WORKS!

- ★ Lower installation cost . . . unskilled labor can do the job!
- ★ No expensive equipment needed...one small wrench is the only tool required!
- ★ Victaulic flexibility absorbs mis-alignment, ground subsidence and traffic vibration!
- ★ Maintenance is nil!



TWO GOOD EXAMPLES OF WHY YOU SAVE WITH VICTAULIC FULL-FLOW FITTINGS. Accurately machined, streamlined inside and out. Note the smooth, unobstructed flow. Engineered to give you increased delivery at lower pumping costs. Be sure to specify Victaulic Full-Flow Fittings wherever you use Victaulic Couplings.

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SELF-ALIGNING PIPE COUPLINGS AND FULL-FLOW FITTINGS

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Earle Spur Gears and Pinions can be furnished in plain, webbed, or spoked types—in sizes from ½" to 30 feet in diameter. Teeth are generated, hobbed, planed or rotary cut by Earle improved methods which produce gears of utmost accuracy.

In addition to spur gears, Earle manufactures the full range of gear types and sizes . . . in practically every gear material. Send for the Earle Gear booklet 42-G which contains full detailed information.

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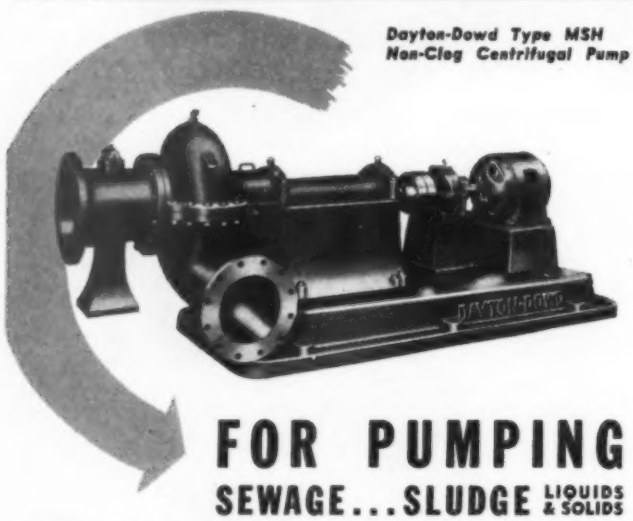
4725 Stenton Avenue, Philadelphia, Pa.

Why not use . . . **EARLE GEARS**
. . . made to YOUR requirements?

Dayton-Dowd Type MSH Non-Clog Centrifugal Pump



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SEWAGE . . . SLUDGE LIQUIDS & SOLIDS

TYPES — Single stage, single suction — mixed flow design. Available in both horizontal and vertical styles.

SIZES — 5" to 14". Capable of passing solids from 3" to 6" diameter.

USES — For handling liquids or solids such as sewage, sludge, paper and pulp stock and other similar substances.

CONSTRUCTION FEATURES — Motor and gas engine driven through reduction gears. Split case design provides easy accessibility. Special design impellers prevent clogging.

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DAYTON-DOWD
Turbine Pumps
Centrifugal Pumps

MEETINGS SCHEDULED:

April 11-13—PEORIA, ILL. (Hotel Pere Marquette).
Illinois Section A.W.W.A. Sec'y, O. T. Birkness, 809 W. Washington Blvd., Chicago 7, Ill.

April 12—LEWISTON, ME.
Maine Water Utilities Association. Sec'y-Treas., Earle A. Tarr, Winthrop, Me.

April 13-14—INDIANAPOLIS, IND. (Hotel Antlers).
Indiana Section A.W.W.A. Sec'y, Charles H. Beckert, State Library Bldg. 402, Indianapolis, Ind.

April 17-18—LITTLE ROCK, ARK. (Marion Hotel).
Arkansas Water & Sewage Conference. Sec'y, Harrison Hale, 114 Chemistry Bldg., Fayetteville, Ark.

April 19-21—NIAGARA FALLS, ONT. (General Brock Hotel).
Canadian Section A.W.W.A. Sec'y, A. E. Berry, Ontario Department of Health, Parliament Bldg., Toronto, Ont., Can.

April 26-28—JACKSON, MICH. (Otsego Hotel).
Michigan Section A.W.W.A. Sec'y, M. N. Gerardy, Detroit Dept. of Water, Detroit, Mich.

April 27-28—UTICA, N. Y. (Hotel Utica).
New York Section A.W.W.A. (Spring Meeting.) Sec'y, R. K. Blanchard, Neptune Meter Co., 50 West 50th St., New York, N. Y.

May 5-6—BOZEMAN, MONT. (Hotel Baxter).
Montana Section A.W.W.A. Sec'y, H. B. Foote, Director, Div. Water & Sewage, State Board of Health, Helena, Mont.

May 8-10—GREENVILLE, S. C. (Poinsette Hotel).
Southeastern Section A.W.W.A. Sec'y-Treas., B. P. Rice, Healey Bldg., Atlanta 3, Ga.

May 11—TRENTON, N. J. (Hotel not selected).
New Jersey Section A.W.W.A. Sec'y, C. B. Tygert, Dist. Mgr., Wallace & Tiernan, Inc., Box 178, Newark, N. J.

May 19-20—BALTIMORE, MD. (Lord Baltimore Hotel).
Maryland-Delaware Water & Sewerage Association. Sec'y-Treas., E. V. Gipe, 2411 N. Charles St., Baltimore, Md.

May 12-13—OLYMPIA, WASH. (Olympian Hotel).
Pacific Northwest Section A.W.W.A. Sec'y, Wm. P. Hughes, City Engr. & Water Supt., City Hall, Lewiston, Idaho.

May 17—SPRINGFIELD, MASS. (Hotel Kimball).
New England Sewage Works Association. (Spring Meeting.) Sec'y, LeRoy W. VanKleeck, State Dept. of Health, Hartford, Conn.

In Small Sewage Plants

YEOMANS "AERIFIER"

serves efficiently and at low cost

AERATION AND FINAL SETTLING IN ONE CONCRETE STRUCTURE

HERE'S an answer to the sewage problem of small communities — the Yeomans "Aerifier". It is designed and built to do an efficient job economically—with a minimum of attention for operation and maintenance.

Square concrete tank, with central aeration section and triangular corner settling compartments, connected only by influent and effluent pipes. No steel baffles to rust and collapse.

Motor-driven "Spiralflo" aeration cone revolving at relatively low speed, sets up spiral circulation from top down—delivers a high degree of purification at exceptionally low power cost.

Exclusive design for conveying mixed liquor to settling compartments. Capacity under control of the operator.

No possibility of short circuiting from aeration compartment to clarifier. No annular openings.

High recirculating capacity—no sludge deposit on tank bottom. Activated sludge is returned from settling tanks to aeration tank, and clear effluent is discharged.

Sludge concentration chamber to draw off excess activated sludge.

For full details on this modern, efficient unit, send for new Bulletin 6650.

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Please send Bulletin 6650 describing Yeomans "Aerifier".

Name_____

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Yes, We're Still Making Time-Tested MONO-CAST Centrifugal Pipe

Under suitable priorities, of course. Fittings also available.

Note: Foresighted managers are planning now to replace substitutes with Cast Iron Pipe at war's end.

AMERICAN CAST IRON PIPE COMPANY

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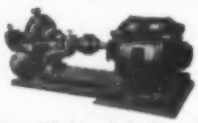
Sales Offices: New York, Chicago, Kansas City, Minneapolis, Dallas, Houston, Los Angeles, San Francisco, Pittsburgh, Cleveland

Plan Ahead With WAR-TESTED PUMPS "by Aurora"

The splendid record of thousands of Aurora Pumps on a myriad of war services is your assurance that your postwar needs will be taken care of superbly as you, too, install Pumps "by Aurora"—the Products of Experience—made by exclusive builders of fine pumps.

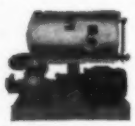
Aurora Deep Well Turbines for all conditions—4" to 24"



Type AD Hor. Split Case, Two Stage Centrifugal

NSA Aurora Centrifugal Sump Pump

Type OD Hor. Split Case Double Suction Single Stage Centrifugal



APCO Horizontal Condensation Return Unit

Type GMC Close-Coupled Centrifugal

APCO TURBINE-TYPE PUMPS—the simplest of all pumps. Ideal for small capacity, high head duties. Silent, compact and lasting.

Type GGU Side Suction Single Stage Centrifugal

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SEE OUR CATALOG IN SWEET'S

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AURORA Always PUMPS

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68 Loucks Street, AURORA, ILLINOIS

May 18-19—COLUMBUS, OHIO (Hotels Fort Hayes & Chittenden).

Ohio Section A.W.W.A, Sec'y-Treas., L. J. Hoffman, City Water Works, 100 Municipal Bldg., Akron, Ohio.

May 18—DURHAM, N. H. (New Hampshire University). **New England Water Works Association.** Sec'y, Frank J. Gifford, 613 Statler Bldg., Boston, Mass.

June 13-16—MILWAUKEE, WIS. (Hotel Schroeder). **American Water Works Association** (1944 Wartime Conference and Annual Meeting.) Executive Secretary, Harry E. Jordan, 500 Fifth Avenue, New York, N. Y.

June 14—KENNEBUNK, ME.

Maine Water Works Association. (Regular Meeting.) Sec'y-Treas., Earle A. Tarr, Winthrop, Me.

June 16-17—SYRACUSE, N. Y. (Hotel Syracuse). **N. Y. State Sewage Works Association.** Sec'y, A. S. Bedell, N. Y. State Dept. of Health, Albany, N. Y.

Sept. 19-22—POLAND SPRING, ME. (Poland Spring House). **New England Water Works Association.** (Annual Meeting.) Sec'y, Frank J. Gifford, 613 Statler Bldg., Boston, Mass.

Oct. 3-5—NEW YORK, N. Y. (Hotel Pennsylvania). **American Public Health Association.** (2nd Wartime Conference.) Chairman, Reginald M. Atwater, M.D., 1790 Broadway, New York, N. Y.

Oct. 12-14—PITTSBURGH, PA. (Hotel William Penn). **Federation of Sewage Works Associations,** Exec. Sec'y, W. H. Wisely, Illinois Building, Champaign, Ill.

Oct. 17-19—AUSTIN, TEXAS (Stephen F. Austin & Driskill Hotels).

Southwest Section A.W.W.A. Sec'y-Treas., George J. Rohan, P. O. Dr. 449, Waco, Texas.

Nov. 2-4—ATLANTIC CITY, N. J.

New Jersey Section A.W.W.A. Sec'y, C. B. Tygert, Dist. Mgr., Wallace & Tiernan, Inc., Box 178, Newark, N. J.

☆ ☆ ☆

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ALL OVER TOWN...

your citizens will welcome soft, clear water!

WATER is easily the most important of the public utilities—more vital than gas or electricity. What *kind* of water is going into the homes, shops and factories in your city? Is it soft and sparkling, free of dirt and iron? It *can* be! Hundreds of up-and-coming communities enjoy good water—supplied by Permutit* equipment.

Get ready for this postwar improvement *now*. Just drop a line to The Permutit Company, Dept. G1, 330 West 42nd St., New York 18, N. Y. In Canada: Permutit Company of Canada, Ltd., Montreal.

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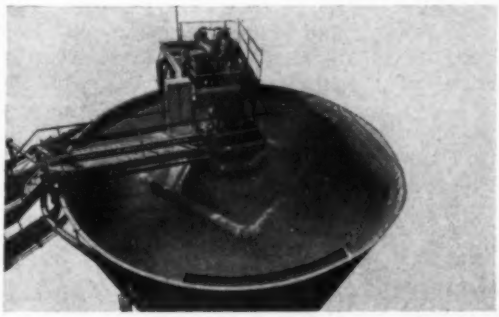

Permutit Spaulding Precipitator removes hardness, dirt and color from municipal water supplies. This new-type equipment for cold lime soda softening takes only half the space of older methods, cuts detention time, saves chemicals. Installations now handle capacities up to 120,000,000 gallons daily.

PERMUTIT

WATER CONDITIONING HEADQUARTERS

JOSAM Backwater Sewer Valves
New Super-Sensitive Side-Swing Control

THIS product offers the solution to the problem of water and sewage backing up and flooding basements, causing serious damage. JOSAM SIDE-SWING OPEN-SEAT BACKWATER SEWER VALVES are designed to open freely for any discharge of water. Close instantly at the slightest backflow. *Can be adjusted to closed seat type when necessary. Write for detailed information.*

Josam PRODUCTS STANDARD OF AMERICA ESTABLISHED 1914

Designers and Manufacturers of Josam Cascade Grease Interceptors with Flow Control —Gas-Oil Interceptors—Shock Absorbers to eliminate hammer in water supply lines— Backwater Flap Valves.

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Executive Offices, 320 EMPIRE BLDG., CLEVELAND, OHIO
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JOSAM-PACIFIC COMPANY,
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THERE ARE NO SUBSTITUTES FOR JOSAM PRODUCTS

Now is the time to act—

if you want to help increase America's 1944 food production

More food must be produced this year and, accordingly, every possible source of fertilizer must be employed. The practice of incinerating or burying sludge has no place in times like these. It means wasting something that is urgently needed in the war effort. Sewage sludge contains fertilizing value which will definitely increase food crops.

You can help increase food production and at the same time establish a source of permanent revenue by converting your sludge into fertilizer. The view above shows how the sewage disposal plant of Kutztown, Pa. is doing this with a Model "NSB-2" Royer Sludge Disintegrator.

The only labor involved is the shoveling of the sludge cake into the hopper of the machine—less than the work required for burning or burial. The Royer disintegrates the sludge to pea size, thoroughly aerates and further dries it, at the same time eliminating trash. It automatically discharges onto pile or truck a valuable and marketable fertilizer. Some Royer users mix chemicals with the sludge in the hopper to produce a high strength fertilizer, which sells at a higher price, of course.

Sewage plants with Royers find a ready market for fertilizer among commercial growers and Victory gardeners. Any seasonal surplus can be used in the city parks.

The cost of a Royer is so moderate that it soon pays for itself. This ruggedly built machine requires little maintenance. Over 5,500 Royers are in use. Available in twelve stationary and portable models—electric motor, gasoline engine and belt-to-tractor driven.

Start this year to convert the cost of sludge disposal into profit. Write today for full information and prices.

THE ROYER FOUNDRY & MACHINE CO.
170 PRINGLE ST., KINGSTON, PA.

PIONEERS IN THE SALVAGE OF SEWAGE SLUDGE

Here and There with Doc Symons

FOR the past month we have been preparing material for the Reference and Data Section of the next June issue, and right here and now we should like to call attention to a too often forgotten fact about the Reference and Data issue.

Each year on the first page of that section appears the statement that "it is our endeavor not to repeat more than one-half of the material from year to year" and "it will, therefore, be necessary for each subscriber to possess issues of two consecutive years if he is to have available . . . a 'complete' file of Water Works and Sewerage Reference and Data Material." Last year we heard of several persons who promptly threw out the preceding year's issue when the new one came in. They regretted their haste at leisure.—Now don't say we didn't warn you in advance.

* * *

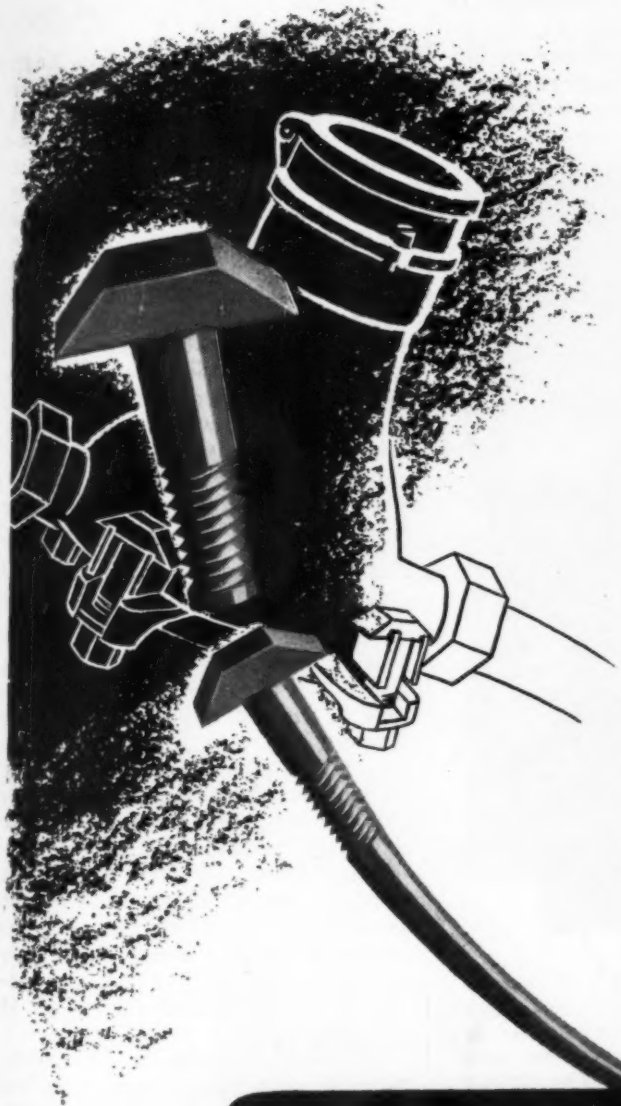
They Whistle While They Work: Elsewhere in this issue we reported on the N. J. Sew. Wks. Assn. meeting and the entertainment provided by a band composed of employees of the Elizabeth, N. J., Joint Meeting Sewage Plant. What we didn't tell you was that not only is there a complete seven piece band (one trumpet player—Maj. Leslie West—on leave) with the conductor d o u b l i n g on drums, but also the orchestra has two extra drummers, likewise employees of the plant,—*and*, the Cons. Engr. for the Joint Meeting, Ellson T. Killam, is available as a trumpet player. Our Editor named the band "The Elizabeth, N. J., Joint Meeting Sewage Treatment Plant Semi-Classical Silver Horn Orchestra," but for short we have dubbed it, "Ed Decher and His Sanitary Seven."

* * *

More News from Brushy Bend.—Paul Cerny of the N. Y. office of

(*Continued on page* 70)

Product improvement through



Bridgeport DURONZE

Product improvement does not necessarily require radical changes in design or construction. For example, in the case of water meters; maintenance costs—labor and time, may be cut substantially merely by using assembly bolts and nuts made from Bridgeport's high-strength DURONZE.

DURONZE bolts and nuts do not rust, and because of exceptional resistance to corrosion and season cracking, they may be used again and again without "freezing" and breaking. DURONZE bolts average 100,000 pounds per square inch in tensile strength, and are therefore much stronger than ordinary steel for bolts.

We supply DURONZE wire to bolt manufacturers who make meter bolts and other screw machine products by the cold-heading and rolled-threading process without the necessity of intermediate or final heat treatments.

Investigate DURONZE III and other alloys of the DURONZE "family" for any problems involving wear, fatigue, excessive corrosion deterioration. Bridgeport's 80-page DURONZE Manual contains complete engineering information on five outstanding alloys, and is free for the asking. Write for your copy today.

Orders for DURONZE sheet, rod, wire or tubing will be accepted in accordance with existing priority regulations.

BRIDGEPORT *Duronze*

"Bridgeport" BRIDGEPORT BRASS COMPANY

"P.F.T." won't be seen in these parts for the duration. Now a Major in the USPHS(R), Paul is stationed at 603 BMA Bldg., Kansas City 8, Mo.—Frank C. (Shad) Roe, San. Engr. for the Carborundum Co. and specialist extraordinary on air diffusion media, will move to Perth Amboy, N. J., where the Porous Products Div. of the company will be located about May 1.—According to TIME magazine, J. A. "Cap" Krug, Director of OWU and "Friend at Court" for the Water Works Man, has been classified 1A. It'll be a shame if they don't defer him after all the fuss that has been made over really non-essential "guys" in Washington. Better still, put him in a Colonel's uniform and keep him on the job in O.W.U.—Tom Riddick is now in Columbia, S. C.; seems to be getting around.—Lt. John McDonald, 0-543065, is now at Foster General Hosp., Jackson, Miss., awaiting assignment. — Charlie Spaulding, formerly Supt. of Filtration at Springfield, Ill., is now with the Engineer Board at Fort Belvoir, Va.—From "Over The Spillway" published by the Ill. Dept. of Health we cribbed this item: "Martin Symons, our oldest water superintendent in Illinois in years of service, has been spending considerable time in the hospital this winter but has been able to keep a finger on the operation of the Danville plant."—Lt. Col. Arthur Morrill, USPHS(R) is back from India but leaves soon again for Ethiopia for a month, then Chungking, China, for a year.—Ed. F. Eldridge, of Mich. State Coll. and specialist in Ind. Wastes, is now Civilian Consultant to the R. & U. branch U. S. Engineers, 9th Corps area, at Salt Lake City.

* * *

R. W. Simpson, Assoc. San. Engr. in charge of operation of the Water and Sewage Plants of the Air Field at Biloxi, Miss., and a former associate of ours at Buffalo, says that when he wrote for the "Free" items in the list of "Where to Find Water Works and Sewerage Information" as given in the June 1943 Ref. and Data Section, he found the following items out of print, "Manual of Sewage Works Operation,—N. J. Engr. Expt. Sta.; Chlorination in Sewage Treatment-APHA; Bulls. 59, 68, 69, 84, and 86,-Iowa State Coll. Engr. Expt. Sta.; and Pump Data-Economy Pump Machine Co." Anyone else have any suggested corrections before the next June issue comes out?

* * *

We received a copy of a letter from a man in the water works field, written to a "noted Consulting Engineer," and commenting on an article in the last issue of W. W. & S. We quote from the letter, "Dear Sir: I was very interested in seeing an article by Marsden Smith on p. 91-92 of the March issue of W. W. & S. After reading the article completely I wondered if the author was writing about water supplies or about the game of bridge. For example, in the first paragraph, I note similarity of wording to that contained in the second paragraph of his bridge book.

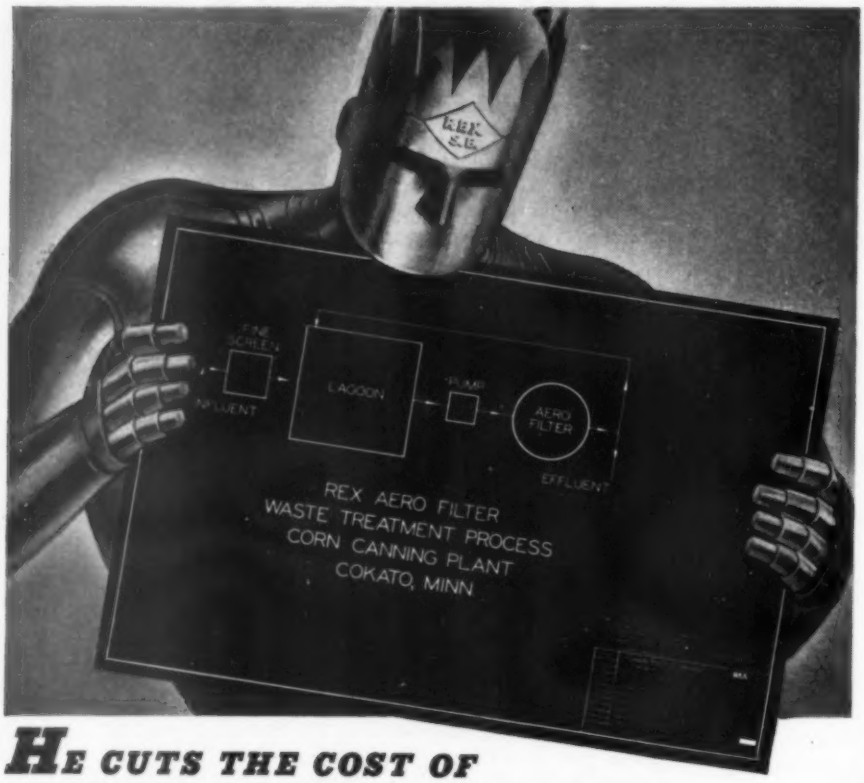
"He goes on to say in the article, 'Why ground gained only to be lost later?'—If you will refer to his bridge book, page 62, third and fourth paragraphs, you will note this similarity . . . 'once you become vulnerable you should never allow the opposition to have the bid lest you lose ground already gained.'

"I could go on indefinitely, as for example his mention of dead-ends, and distribution-depreciation such as when he had a yarbrough, etc., etc. May I have your expert opinion on what the author had in mind when he wrote this article." signed EAS.

* * *

It was at the Boston meeting of the NEWWA last month where we

(*Continued on page* 72)



HE CUTS THE COST OF INDUSTRIAL WASTE TREATMENT...

Rex Sanitation Engineering—an important member of the Rex Engineering Family—knows that, in many cases, the cost of installing and maintaining a plant for the treatment of industrial waste prohibits its construction.

Rex S. E. knew that much larger daily capacities could be successfully realized with a smaller filter bed if a continuous, low momentary rate of application could be maintained. To accomplish this, Rex S. E. designed his Aero-Filter . . . the most efficient and economical method of industrial waste treatment.

He designed his Aero-Filter so that it disperses a rainlike spray over each square foot of filter surface—24 hours a day. This design permits the use of smaller filter beds, eliminates the need for excessive recirculation and oversize primary settling tanks and materially reduces the installation, maintenance and power costs.

Rex S. E. and his staff of experienced sanitation engineers can help you with your waste treatment problems. Write them for complete information on Rex Aero-Filters and the other types of efficient Rex Sanitation Equipment. Address Chain Belt Company, 1610 West Bruce Street, Milwaukee 4, Wisconsin.

REX **SANITATION EQUIPMENT**

Triturators • Bar Screens • Tow-Bro Sludge Removers • Slo-Mixers
Aero-Filters • Rapid Mixers • Grit and Sludge Collectors and Grit Washers

CHAIN BELT COMPANY *OF MILWAUKEE*

Member of the Water and Sewage Works Manufacturers Association, Inc.

What was the Real Cost of this Water Main Cleaning Job?

Job consisted of 85,000 ft. of 6 inch to 12 inch lines. FLEXIBLE'S bid averaged approximately 2¼c per foot ($1,870) higher than nearest competitor.

YET FLEXIBLE WAS THE LOW BIDDER!

Because FLEXIBLE methods saved the city:

(a) More than 40 excavations.

(b) The assistance of a fire department pumper with three firemen.

(c) Interference with traffic.

These savings were estimated by the city to total $2,560, making FLEXIBLE the low bidder by $690!

FLEXIBLE UNDERGROUND PIPE-CLEANING CO.

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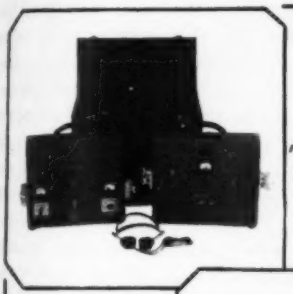
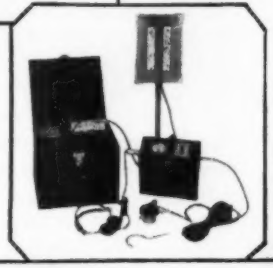
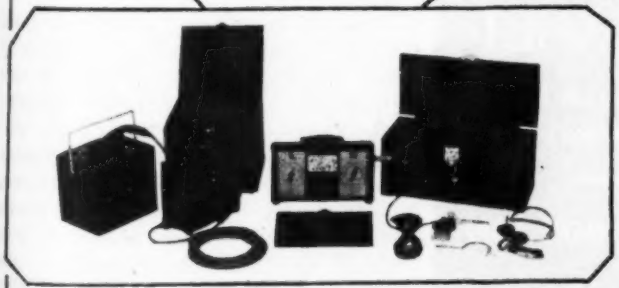
BOX 694, PITTSBURGH, PENNSYLVANIA • BOX 694, GULFPORT, MISSISSIPPI BOX 165, ATLANTA, GEORGIA



"UNIVERSAL" TRANSMITTER-RECEIVER PIPE LOCATOR.



"UNIVERSAL" **ENERGIZER TYPE** PIPE LOCATOR.



"Universal" *Leak survey Instrument*

3 BIG *Answers*

to your

WATER LEAK PROBLEM

The BOB WHITE **ELECTRONIC** BOX LOCATOR

LOCATES ALL METAL UTILITY SERVICE BOXES AS FAST AS YOU CAN WALK!

MAIL THIS COUPON TODAY!

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11 Hill St., Newark 2, N. J.

Please send me literature and information on Water Leak problems.

Name .....

Address ..... State .....

Manufactured by

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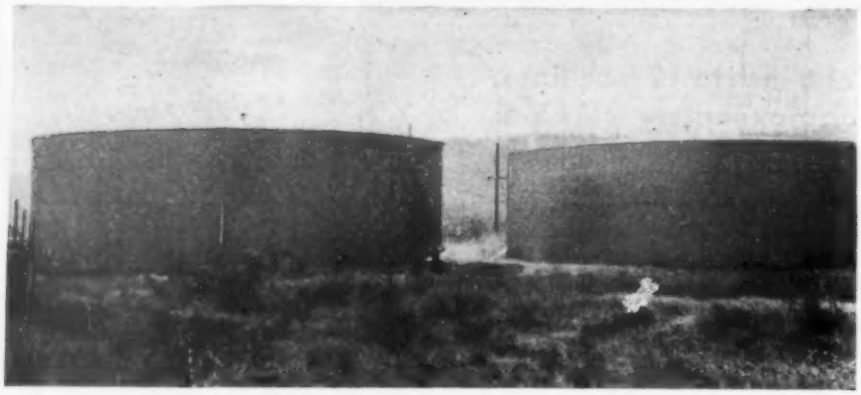
Dependable Protection

FOR TANKS, TOWERS, STRUCTURAL STEEL AND ALL EXPOSED METAL SURFACES



Reilly Coal Tar Paints

● The Reilly line of protective coatings includes products designed especially to give maximum protection to all types of metal, tile, stone and concrete surfaces under all conditions of climate, soil and service—whether above ground, under ground, or under water.

REILLY COLD APPLICATION No. 40—Designed especially for use on tanks, structural steel and other metal surfaces exposed to the atmosphere and to corrosive gases.

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REILLY PIPE ENAMEL—For dependable protection—inside and out—on steel water lines.

Reilly COAL TAR PRODUCTS

17 PLANTS To Serve the NATION

Complete information on these products and other REILLY Protective Coatings will be sent on request.

REILLY TAR & CHEMICAL CORPORATION

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Reilly Protective Coatings

IMPROVED JOINTING COMPOUND

Tegul-MINERALEAD

for Bell & Spigot Main

- Sulphur base; quick sealing, speeding laying and backfilling.
- 10 lb. ingot form, easily handled, stored and shipped. Impervious to rain. Cannot change composition.
- Makes permanently tight joints. Goes 3 to 5 times as far as lead, helping conserve a strategic war metal.
- For money-saving information, write

The ATLAS MINERAL Products Company of Pa.
Mertztown Pennsylvania

ANTHRAFILT

A Filter Medium For All Purposes

ANTHRACITE EQUIPMENT CORP.
101 Park Ave. New York

H. G. Turner Research Engineer
STATE COLLEGE, PA.

learned that WAC troops use twice as much water in a barracks as do their male compatriots.—It was at the same meeting when Prof. Russell on finishing his lecture at the "Water Works School" called for questions and the first one was "What do you do with your notes." Although *we* didn't ask the question, we'd like to know too, for we'd like to publish those notes ourselves.

* * *

Be your own Dowser. We have always been fascinated by the Water Witch or Dowser who could locate water beneath the ground with the aid of a Divining Rod made of a forked stick from a peach tree. Lately we have been hearing at several meetings about modern electronic devices which will locate water leaks beneath the ground. We haven't any preference for any particular type but we offer the following slogan for the purveyor's consideration—"Be Your Own Water Witch with the *Modern* Divining Rod."

* * *

By the time this issue is off the presses it will be time for the annual meeting of the Canadian Section of AWWA. Some one suggested recently that we should go to that meeting and see how the manufacturers handle the entertainment problem there. We referred him to our column of last Nov. wherein we came out for the system of our Canadian friends.—They have dispensed with entertainment in manufacturers' rooms and all manufacturers band together to put on general entertainment including refreshments at one central location—open *only* when technical sessions or scheduled meals are not under way. Some die-hards may not take to the idea on this side of the border, but you will be interested to know that since that item appeared in this column representatives of four large manufacturing concerns have agreed with us that the Canadian Way is a good one and should be tried out in this country.

* * *

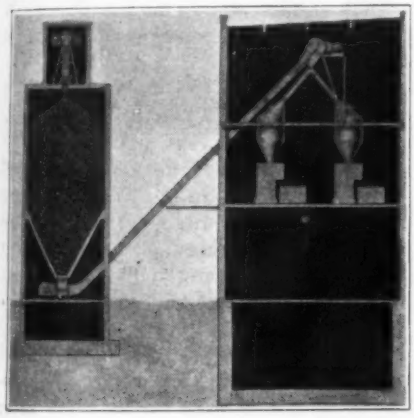
Among the far out-of-staters present at the 29th meeting of the N. J. Sew. Wks. Assn. were Frank Lovett, Link-Belt, Chicago; Bart Marshall and Carlton Lind, Chain Belt, Milwaukee; and J. J. Conway, Chicago Representative for Ralph B. Carter. —Of course "Pete" Wisely, Federation Secretary, was there to give visual proof of the expanding service of the Federation of Sew. Wks. Assn's.—Some day instead of each of us belonging to a State Association, the Federation will have become so useful that we shall all belong to a national organization of

which the present Associations will become Sections, as in AWWA. As it is no individual has the right to refer to himself as a member of the Sewerage Works Federation. He can only be a member of a State or Sectional Association, which in turn is a Member Association in the Federation of Associations.

MANUFACTURERS' *and* EQUIPMENT News

New Rex Uni-Flo Conveyor

The Chain Belt Company of Milwaukee has announced the manufacture of a new conveyor-elevator system, known as the REX Uni-Flo, a

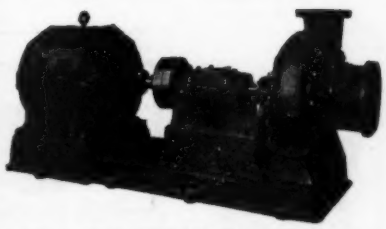


new and unique method for mass handling of free flowing bulk materials.

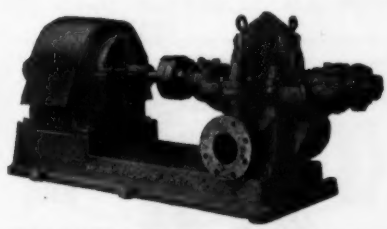
Composed of a chain belt equipped closely spaced scraper-carrier flight, the Rex Uni-Flo is a conveying unit of continuous stream type, operating in an enclosed casing. Among the distinguishing features of the new conveying system are its positive and unique discharge mechanism to remove all material in the conveyor system at the point of discharge; has self-feeding and self-cleaning characteristics with a minimum of churning and degradation of material. The Rex Uni-Flo unit is flexible in application with a wide choice of basic units and few limitations as to layout, being able to convey material

Bottoms Up...

If you could see the bottom of your water supply reservoir, you would very likely be astonished at the depth of sediment and debris which has accumulated over a period of years. In many localities water storage reservoirs are gradually filling up with deposits, but this need not mean eventual abandonment of the reservoir and the high cost of building a new one to replace it. The most economical remedy for this condition is a Morris Hydraulic Dredge, which has been used for this work by municipalities and power companies all over the country—in some cases at a cost of less than 10 cents per cu. yd. of excavated material. Complete information will be sent on request.



Heavy-Duty Material Handling Pump



Double Suction Horizontally Split Pump for Clear Liquids

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Baldwinsville, N. Y.

MORRIS
ESTABLISHED 1864

Export Office:
50 Church St.,
New York 7, N. Y.

CENTRIFUGAL PUMPS

SPARLING MAIN-LINE METERS

Home of Navy Uses 50 Sparlings

LONG BEACH, California, has been Sparling-minded for 20 years. This year's purchases brought their total to over 50 Sparling Meters. War work calls for a lot of water!

SPARLING Tube Meters are as easy to install as a length of the pipe itself on any main-line from 2-inch up—Flanged, Threaded, or Bell & Spigot.

Saddle-type meters can be mounted on lines in place in a couple of hours.

•

Of even greater importance is the Consistent Accuracy of measurement assured when you install Sparling Meters.

•

Bulletin 308 *comes at your request*

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CHICAGO 16.....3104 South Michigan Ave.
622 Broadway.....,CINCINNATI 2
101 Park Avenue.....NEW YORK 17
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The Perfected Method for Making
SEWER PIPE JOINTS OF CEMENT

- No jute used—gasket centers spigot.
- Definite space in each joint for cement.
- Form confines cement-grout to lower portion of joint.
- Particularly advantageous in water-bearing trenches.
- Infiltration minimized.

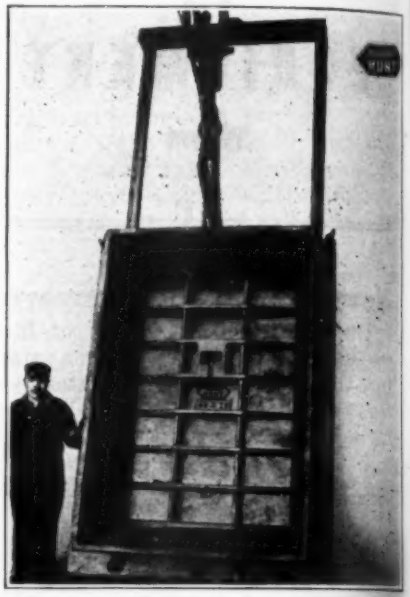
L. A. WESTON **Adams, Mass.**

horizontally, vertically, or at any angle. A typical application is shown in the accompanying photograph.

For more information on Rex Uni-Flo, Bulletin 442, giving capacity tables, horsepower formulas, general arrangements, and dimensions is available on request to the Chain Belt Company, Milwaukee, Wis.

"Curved Entrance" Increases Sluice Gate Efficiency

An important innovation in sluice gate design is shown in the accompanying photograph. This particular gate was recently designed and built



by the Water Control Apparatus Div. of the Rodney Hunt Machine Company of Orange, Mass., for an installation in Mexico.

The huge casting which forms the entrance to this 48 in. x 72 in. sluice gate has been curved to cut down efficiency losses as the water flows through the gate opening. The degree of curve was worked out after extensive tests which proved the worth of this simple modification of conventional gate design.

Combination Etcher and Demagnetizer

The Ideal Commutator Dresser Co. has developed a new tool that is designed for use as either an etcher or demagnetizer. It is enclosed in an attractive case with a removable, hinged cover.

To etch small tools and parts, simply place them on the work-plate, turn switch to proper heat and start etching. The 14 heads give a wide range for marking all iron, steel and their alloys from small delicate parts up to large smooth castings.

To use the instrument to demag-

netize, it is only necessary to turn the switch to either No. 1 or No. 2 position and proceed as with an ordinary demagnetizer.

The overall dimensions of the unit are 8¼x11½x8⅝ in. (Size of workplate is 8¾x7¾ in.) It weighs 39

pounds and is readily portable in its compact carrying case.

For details and descriptive folder write Ideal Commutator Dresser Co., 1615 Park Ave., Sycamore, Ill.

Schwarzler Named as Foxboro Export Head

The Foxboro Company, Foxboro, Mass., have announced the appointment of Charles Schwarzler as Manager of the Export Department succeeding Henry B. Moelter, who died January 20.

C. Schwarzler

Mr. Schwarzler, formerly Foxboro's Manager of Sales Promotion, is a trained engineer with ten years of experience in the application, promotion, and sale of Foxboro instruments. He has already assumed his new duties as Export Manager.

MacMillan Appoints Cheney Advertising Manager

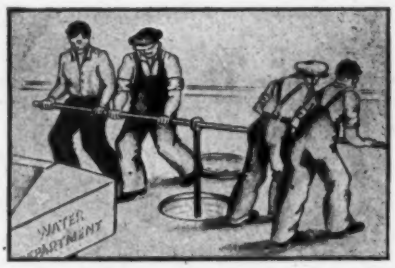
Recently announced by the MacMillan Petroleum Corporation was the appointment of Howard W. Cheney as advertising and sales promotion manager. Mr. Cheney has held a similar position with Lockheed Aircraft Corp. for the past year and prior to that was with Lord and Thomas Advertising Agency. Mr. Cheney's main activities will be directed toward the sale of Macmillan's Ring-Free Motor Oil. Follow-

ASK THE GANGS THAT RUN 'EM - THESE NEW DEAN GATE OPERATORS.

GANG	HAVE	GANG	HAVE
*Abington, Mass.	1	Newark, N. J.	2
Atlanta, Ga.	1	New York, N. Y.	12
Baltimore, Md.	1	Brooklyn, N. Y.	5
Boston, Mass	2	Bronx, N. Y.	5
Buffalo, N. Y.	4	Queens, N. Y.	5
Clarksburg, W. Va.	1	Richmond, N. Y.	5
Cleveland, Ohio	4	Oakland, Cal.	1
East Orange, N. J.	1	Paterson, N. J.	1
Fitchburg, Mass.	1	Pawtucket, R. I.	1
*Greenfield, Mass.	1	Providence, R. I.	5
Hackensack, N. J.	1	*Holyoke, Mass.	1
Hartford, Conn.	1	*Louisville, Ky.	1
Honolulu, T. H.	1	Seattle, Wash.	2
Kansas City, Mo.	1	*Shreveport, La.	1
Kenosha, Wis.	1	Sioux Falls, S. D.	1
Montclair, N. J.	1	Springfield, Mass.	1
New Bedford, Mass.	1	Spokane, Wash.	2
Tampa, Fla.	1	Washington, D. C.	4
Waterbury, Conn.	1	Wichita Falls, Tex.	1

*On order.

10 minutes of rest



One hour of toil

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CHEMICAL FEEDERS, INC.

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Pioneer Producer of GREENSAND ZEOLITE MINERAL

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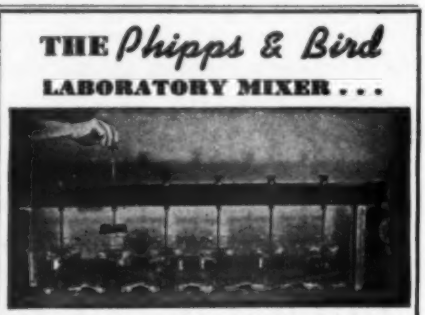

IS the important piece of equipment in the Modern Water Works Laboratory. Now being used by leaders in water works research. Many superintendents and chemists have been able to reduce their chemical costs by the control of chemical dosages with this mixer. Write for literature.
PHIPPS & BIRD, INC. Richmond, Va.

ing a three months' tour during which he will call on MacMillan's district offices and distributors, Mr.

H. W. Cheney

Cheney will make his headquarters at the main office at 530 West 6th St., Los Angeles.

Pittsburgh Meter Elects New Officials

At the annual meeting of the Pittsburgh Equitable Meter Co., Col. W. F. Rockwell was elected Chairman of the Board and will henceforth serve in the dual capacity of President and Board Chairman. Also elected were Edgar W. Meyers as Director and William S. Potter as Vice President. Mr. Meyers, Treasurer for the past eighteen years, will continue to serve in that position. Mr. Potter formerly was Assistant Works Manager at Pittsburgh and has been connected with the company for the past fourteen years in various engineering and production capacities.

E. W. Meyers

W. S. Potter

Bill Orchard Again Honored

William J. "Bill" Orchard, General Manager of Wallace & Tiernan Inc., who received the citation of the Belleville Manufacturers Association last December for his "services to management and labor in our communities in World War II" was recently designated as "the outstanding citizen for the year 1943"

in Maplewood and the four municipalities of the Oranges.

Although the citation from the Chamber of Commerce and Civics of the Oranges and Maplewood stemmed from Mr. Orchard's work on civic and humanitarian problems in these communities in the past quarter century, it, like the Belleville citation, is directly traceable to his work as General Chairman of the Community Manpower Mobilization Committee, a committee of businessmen and industrialists which Mr. Orchard formed in order to solve the labor needs of the Newark Area.

There are few persons in the field of water works operation or sewage treatment who do not know "Bill" Orchard, not only as General Manager of Wallace & Tiernan, but also as a very productive member of the Am. Water Wks. Assoc., the Fed. of Sew. Wks. Assoc., and the Water & Sewage Works Mfgs. Assoc.

United Steel Corp., Ltd., to Manufacture Chain Belt Products

For many years United Steel Corp. Ltd. of Toronto, Can., has distributed Chain Belt products. Now comes the announcement that hereafter United Steel will manufacture many of the products of the Chain Belt Co. of Milwaukee. These will include new REX Uni-Flo Elevator Conveyors for bulk material handling and also a comprehensive line of REX Sanitation Equipment for water and sewage treatment. Chain Belt engineers will cooperate in the application of this equipment to the needs of Dominion customers.

Builders and Omega Agency Changes

Builders - Providence, Inc., of Providence, R. I., and Omega Machine Co. of Kansas City, Mo., affiliated companies, have announced that since March 1, 1944, W. D. Taulman & Associates of Atlanta, Ga., are handling the products of both concerns for water and sewage works applications in Eastern Tennessee and in the states of Alabama, Florida, and Georgia. The Florida office of W. D. Taulman & Associates is located at 1463 Talbot Ave., Jacksonville, Fla., and is under the supervision of C. L. Timmons.

Evans L. Shuff, 412 Title Building, Atlanta, will continue as Builders "Industrial" representative and is now handling the sale of Omega products for power plant and industrial applications in Georgia, Ala-

YOUR CALL FOR ACTIVE DUTY
Just as soon as it is "over, over there" millions of demobilized service men will look to you, and men like you, for jobs. It will be your turn to swing into action.
There exists today an accumulation of millions of dollars of deferred water and sewage works maintenance, rehabilitation, expansion, and other needed local public works. To have this needed work in BLUEPRINT FORM—READY FOR CONTRACT, is the responsibility of local planning and governing bodies.
We join the Committee on Water and Sewage Works Development in urging you, for the welfare of your community and the Nation at large, to determine tomorrow's needs and BLUEPRINT NOW!
BLUEPRINT NOW
MATHEWS HYDRANTS
400 CHESTNUT STREET, PHILADELPHIA, PA.
ESTABLISHED IN 1803
Made by R.D.WOOD Company
MANUFACTURERS OF SAND SPUN PIPE (CENTRIFUGALLY CAST IN SAND MOLDS) AND R. D. WOOD GATE VALVES

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Write today for actual case histories of plants now using the ideal ferric coagulant.

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WATER AND
SEWAGE TREATMENT
E. M. SERGEANT PULP AND CHEMICAL CO., INC.
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NEW YORK 1

BUY
WAR
BONDS

bama, Florida, and all of Tennessee.

John R. Purser Sales Engineers, Inc., of Charlotte, N. C., adds the Omega line of gravimetric and volumetric dry chemical feeders to Builders' line of flow meters, flow controllers, etc. Purser Sales Engineers covers all of North and South Carolina.

John S. Coey to Hooker Sales Development

The Hooker Electrochemical Co. announces the appointment of John S. Coey to its Sales Development Department with headquarters in Niagara Falls, New York.

John S. Coey

Mr. Coey is a graduate in chemistry from Amherst College and for the past seven years has been in the manufacturing department of the company at the Niagara Falls plant, where he was in charge of the process study group.

Carborundum Appointment

The Carborundum Company of Niagara Falls, N. Y., has announced the appointment of Charles W. Sprenger as District Manager for the Metropolitan, New York district, to succeed the late John Storm.

Announcement has also been made that Joseph C. Steele has been appointed District Sales Office Manager in New York, to succeed E. W. Martin who was named Regional Sales Office Manager of the Eastern sales districts.

To "Bill" Highberger, the Purple Heart

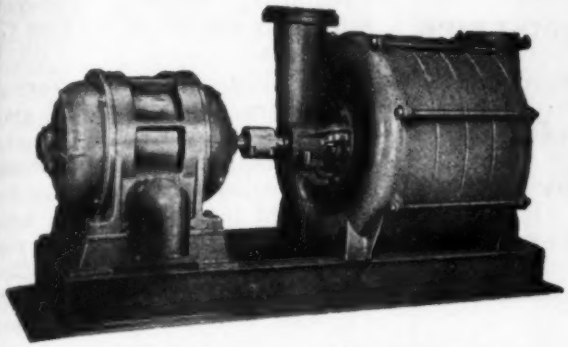
(A Posthumous Award)

Second Lieutenant W. W. ("Bill") Highberger, 37, of the Chemical Warfare Service, U. S. Army, reported missing in action in the European theatre a year ago and now listed as lost in action, has been posthumously awarded the Order of the Purple Heart "for military merit and for wounds received in action." The decoration has been presented to his widow, Mrs. Dorothy F. Highberger.

Lieut. Highberger received his

Whatever you may need in a

BLOWER OR EXHAUSTER



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FOR CONSTANT PRESSURE AT ALL VOLUMES

No controls required for pressure, power or relief, because the pressure is automatically maintained over full capacity range and never exceeds the maximum for which the machine is designed. No internal lubricant is required because the air or gas is delivered clean and dry. Built single stage and multistage, for pressures up to 7 p.s.i. or vacuum up to 10 in. Hg. and for capacities up to 11,250 c.f.m.

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FOR CONSTANT VOLUME AT ALL PRESSURES

Positive displacement, with maximum volumetric efficiency provided by close accurate clearance between impellers and casing. Several distinctive features of design and construction also make these units particularly sturdy and long lived. Built for pressures up to 12 p.s.i. or equivalent vacuum, and for capacities up to 6,200 c.f.m.

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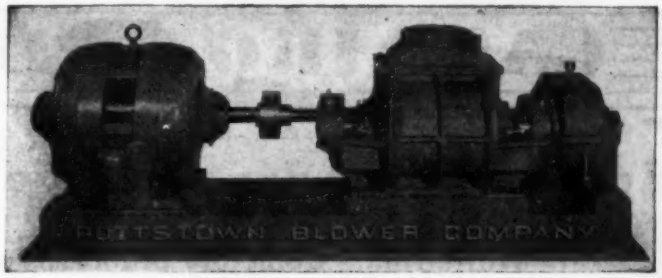

ALLEN BILLMYRE COMPANY

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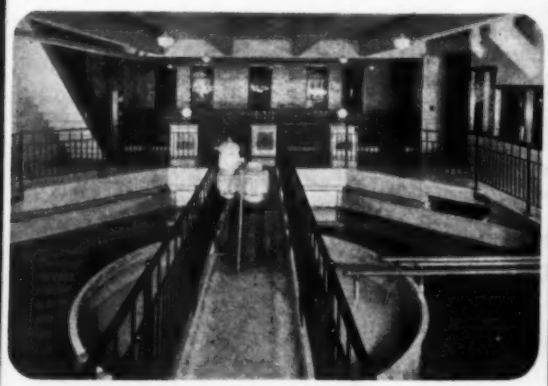
Take advantage of this. Standardize on Infilco Products — everything from Accelators to Zeolites. Place undivided equipment responsibility squarely on the shoulders of Infilco. You'll get better results.



2,000,000 g.p.d. Accelator Softener at Antigo, Wisconsin

There are Accelators for Softening, Clarifying and Stabilizing—and you can't beat them for PERFORMANCE and ECONOMY. Ask for Bulletin 1824.

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Bulletin 293B

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Bulletin 321A

FILTER GAUGES
Bulletin 329

LIQUID LEVEL GAUGES
Bulletins 326 and 329

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Bulletin 335

KENNISON OPEN FLOW NOZZLES
Bulletin 334A

CHRONOFLO TELEMETERS and CONTROLLERS
Bulletin 320A

TOLEDO-CHRONOFLO CONVEYOR SCALES
Bulletin 322

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SHORT BODY BELL & SPIGOT SPECIALS

Large stock enables us to make prompt shipments.

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SIZES 2" TO 84"

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on the occurrence, movement and work of the earth's waters

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many illustrations, charts, tables.

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This book brings you full information on the waters of the earth — excepting the oceans — and the development, status, and problems of the science relating to them. Presents the known facts, principles and laws involved in the course and function of all these waters throughout the hydrologic cycle — covering rain, snow, glaciers, rivers, lakes, soil moisture, and the deeper subterranean waters.

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WATER WORKS & SEWERAGE

330 So. Wells Street — Chicago 6, Illinois

commission in September, 1942, while he was associated with The Mathieson Alkali Works, which he joined in March, 1932, as a sales representative, becoming well-known and highly popular in the New York sales area.

"Bill" Highberger was a native of Greensburg, Pa., and a 1927 graduate from Lafayette College, where he was outstanding as a swimmer and a football player, having been mentioned for All-American honors in football. For the past ten years, his home was in Mt. Vernon, N. Y., where Mrs. Highberger and their two sons, John and Paul, still reside.

Worthington's 103rd Year Biggest in History

Operations of Worthington Pump and Machinery Corporation for 1943 were the largest in the 103-year history of the corporation, and represented an increase of 47 per cent over the sales for 1942. Worthington's unfilled order balance at the beginning of 1944 was approximately the same as a year earlier.

While virtually 100 per cent of Worthington's 1943 output went to the Navy, Maritime Commission, Army, Rubber Reserve, Lend-Lease, other government agencies and to essential war industries, the corporation's normal peace-time line of products accounted for approximately 80 per cent of the record total.

Worthington's development program, involving expanded production and research facilities, is not only helping to meet enlarged production schedules, but provides permanent facilities for increased peace-time output of its regular line of products.

Automatic Pipettes

A new automatic pipette has been developed by the Macalaster, Bicknell Co. of New Haven. Contents of the pipette are delivered by raising

a plunger lever with the thumb, the chamber having received a predetermined volume from the flask containing the solution. The dispenser assembly may be had for pipetting quantities from 5 to 100 ml., each operating with flasks holding 250, 500, 1000, 2000 ml. of solution. Special combinations are also available. Further information may be obtained from the Macalaster, Bicknell Co., New Haven, Conn.

Electronic Bin Level Indicator

An electronic bin level indicator, for use with coarse or fine dry materials, operating entirely on electronic principle, is a recent device of the Max Mosher Electronic Control Systems.

The device consists of two parts, a detector box which is attached to a probe extending into the bin. The probe is connected to a series of vacuum tubes in the box. The second box is a signal control attached to a series of colored lights which show when the bin is full, empty, or partially full. It is possible to hook up the device to produce an audible signal through a series of appropriate relays.

Information on this bin level indicator may be obtained from Max Mosher Electronic Control Systems, 130 West 42nd St., New York 18, N. Y.

Westinghouse 1943 Production Records at All Time High

As with the case of many other industrial concerns, the Westinghouse Electric and Manufacturing Co. surpassed all previous production records in 1943. Net sales billed were 47 per cent ahead of 1942, after voluntary price reductions in line with the company's renegotiation agreement in 1942. The Westinghouse company does not face the major reconversion problem of many other plants, but it still will be faced with problems in returning to civilian production, and as long as the peak of the war is still to come, no slackening of war work is anticipated.

At the end of the year, some 115,000 persons were employed at Westinghouse, compared with 97,000 in 1942, and 48,000 in 1939. The training and organization of some 83,000 new Westinghouse employees has been necessary since the start of the defense program, approximately 18,000 of these persons representing replacements for persons now in the armed forces.

DEPENDABILITY
24 HOURS A DAY

JOHNSON *Right-Angle*
PUMP DRIVE

★ SEWAGE ★ WATER WORKS ★
FIRE FIGHTING ★ FLOOD CONTROL

The Johnson Right-Angle Gear Drive is used as a "connecting unit" between the pump and the power unit. Illustration shows a combination application. These drives are manufactured in a variety of types and sizes, each designed to meet the specifications of a wide range of applications—Sewage Disposal; Water Supply; Fire Fighting; Flood Control; etc.

★ EFFICIENT ★ DEPENDABLE
★ ECONOMICAL ★ COMPACT
★ FULLY ENCLOSED ★ LONG LIFE

The Johnson Right-Angle Gear Drive is sold through Pump and Engine Manufacturers—their local representative will explain the many advantages of this drive which is used by scores of municipalities. Write for Catalog No. 12.

JOHNSON GEAR
& MANUFACTURING CO., LTD.
MAIN OFFICE AND WORKS: BERKELEY, CALIFORNIA

Dresser's Production Soars

Combined sales of Dresser Manufacturing Company of Bradford, Pa., and subsidiaries, for the fiscal year ended Oct. 31, 1943 reached an all-time high of more than twice those for 1942. The backlog of unfilled orders continues at a high level. A substantial part of this, as in the past year, is for standard products; the remainder consisting of war items for direct military use.

Dresser Manufacturing Company and subsidiaries comprise a group of seven companies under a common ownership, all known as Dresser Industries, which includes the parent, Dresser Manufacturing Co., The Bryant Heater Co. of Cleveland, Clark Bros. Co., Inc., and Van der Horst Corporation of America, both of Olean, N. Y., Pacific Pump Works of Huntington Park, Calif., Bovaird & Seyfang Manufacturing Co. of Bradford, Pa., and Dresser Mfg. Co., Ltd., of Toronto, Ontario.

To Reduce your Vacuum Filter Costs

ISCO *Ferri-Cl₃or*

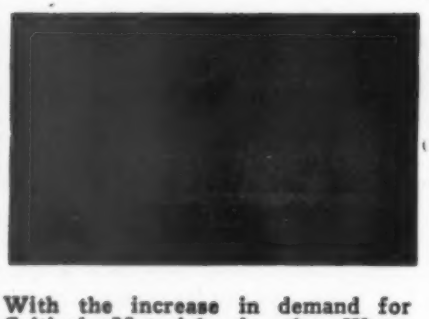
The Modern and Efficient COAGULANT

FERRIC CHLORIDE

INNIS, SPEIDEN & COMPANY
Established 1816
117 Liberty Street . . . . . NEW YORK
CHICAGO • CLEVELAND • CINCINNATI
BOSTON • PHILADELPHIA • GLOVERSVILLE, N. Y.

View showing Tate Process in Pipe Joint. Note thoroughness of Lining.

Help Save Critical Materials · investigate TATE Cement Lining Process



THE TATE PROCESS ACCOMPLISHES

1. Water mains cleaned and cement-lined without removing pipe.
2. Eliminates discoloration and further cleaning costs.
3. Reduces pumping costs.
4. Restores reduction in head and flow co-efficients. This means full fire protection and lowered insurance rates.
5. All Joints cement-lined . . . eliminates bacteria in joints.
6. Does the job with minimum interruption of service to consumer.

With the increase in demand for Critical Materials in the Water Works field *now* is the time to investigate the Tate Cement Lining process—and see what it can do to restore the efficiency of your old water mains.

Write for Literature

TATE PIPE LININGS, Inc.
ANDOVER, MASS.

J. W. Fleet Dies

J. W. Fleet, a veteran on the sales staff of Pittsburgh-National Meters died suddenly on March 2, 1944 at his home in Brooklyn, New York. He first joined the National Meter organization in 1911 and covered the Pacific Northwest territory for a

J. W. Fleet

number of years. Later he was assigned to the New York State territory and also worked in Canada. For over 15 years he served as Sales Manager for the National Meter Company, and during recent years has been District Manager in Brooklyn for the combined Pittsburgh-National organization.

Cochrane Adds Rotameters to Instrument Line

Cochrane Corp. of Philadelphia has announced the acquisition of exclusive sales rights to the line of Rotameters manufactured and sold by Rotameters, Inc., of Jenkintown, Pa. No change is to be made in the personnel of the two companies, William C. Bennett being manager of Cochrane's appliance division, with W. W. Tomes in charge of sales, and William Melas in charge of engineering. The Rotameter will be sold by Cochrane flow meter representatives.

[Ed. Note: The reader should not confuse Rotameters Inc. with Fischer and Porter of Hatboro, Pa., who manufacture and sell Rotameters also.]

Innis Spieden Chicago Manager Dies

Charles W. Brown, manager of the Chicago Branch of Innis, Spieden Co., New York, died in Chicago on March 15th. Mr. Brown, a native of Crandall, Texas, had been associated with Innis, Spieden and Co. since May 1907. Throughout his association with the company he was active in Chicago and the middle west territory. He had attended the Chicago School of Pharmacy and Northwestern University.

Hunt to Manage C-H's Atlanta Office

Cutler-Hammer, Inc., Milwaukee, has announced the appointment of G. E. Hunt as Acting Manager of the

G. E. Hunt

Atlanta territory with offices and warehouse at 134 Marietta St., N.W., in Atlanta, Ga. Mr. Hunt has served this field in offices in New York, Philadelphia, Cleveland, Milwaukee, and was most recently manager of the Indianapolis office of "C.-H."

LITERATURE AND CATALOGS

Simplex Type MO Meters are presented in Bulletin 300 of the Simplex Valve & Meter Company, Philadelphia, Pa. This 16-page bulletin, just issued, sets forth in clear and concise form the merits of the Simplex MO meter. It shows by diagram and cutaway drawing the principle of operation of this meter, discusses the float movement relative to changes in velocity, and overall efficiency from weighed water or volumetric tests.

A complete discussion and presentation of the operation of Simplex type MO as applied to various primary devices is given, with a drawing showing where the installation can be made; operating principles of flow chart, capacity table, types and mountings, the Simplex Venturi head water manometer, and suggested specifications complete the book.

Bulletin No. 300 on Simplex Type MO Meters may be obtained from Simplex Valve & Meter Company, 68th & Upland Sts., Philadelphia 42, Pa.

Bellmaster, Style 85, is Dresser's latest development in a mechanical joint for C.I.P. This style 85 Bellmaster joint for cast iron pipe is being reintroduced, having been first introduced in 1941, before war production interfered with its supply.

CEMENT GUN COMPANY
"GUNITE" CONTRACTORS
GENERAL OFFICES—ALLENTOWN, PENNA., U.S.A.

REHABILITATED WITH "GUNITE"

This is the Lower Doughty Pond Dam of the Atlantic City, N. J., Water Department, a poured concrete structure with fresh water upstream and a tide water downstream toe. Some years ago it became badly eroded, as shown by the left-hand photo. The center photo shows "GUNITE" being placed to a minimum of 6" with double reinforcing. The right-hand view shows the finished job, completed by us in 1941. Both upstream and downstream faces were reintegrated, as well as the wing walls.
Many municipalities have saved big money by the use of "GUNITE" in their reservoirs and sewers. Read how in our Bulletin 2200. We'll send it on request.

MANUFACTURERS OF THE "CEMENT GUN"

Don't Wait
tell us now!

Our representatives will soon be calling upon you and renewing old friendships. We are gradually getting into position to release them for at least part-time travel.

But please don't wait. Now is the time for a seasonal check-up of your water works requirements.

Our real job is producing specialized items for our armed forces on the fighting fronts, but we are also producing Water Works Materials for the home front. You can help us immensely by getting your orders in early, so that we can provide you with enough and on time.

LET'S ALL BACK THE ATTACK—BUY WAR BONDS

OUR SEVENTY-FIFTH ANNIVERSARY

COPPER • BRASS • LEAD • IRON
HAYS Water Works PRODUCTS
HAYS MFG. CO., ERIE, PA. • Since 1869

A *Flexible* AIR SUPPLY

Plan now those future improvements in your Sewage Treatment plant. Plan, also, to profit from the experience of top-flight engineers—by specifying "Roots - Connersville *Dual Impeller Blowers*". Each unit offers you the capacity advantages of THREE separate and different size blowers, thus making it possible to vary the air supply to exactly meet changing demands. In addition, you profit from the compactness and economy of a SINGLE-UNIT installation. Write for bulletin.

ROOTS-CONNERSVILLE BLOWER CORP.

404 Mount Ave., Connersville, Ind.

BONDS BOUGHT TODAY

Help Win Beachheads Tomorrow

Unusual flexibility in air supply, with minimum power consumption, is obtained at a North Carolina Sewage Disposal Plant with three "R-C" Dual Impeller Blowers (shown in photo). Each of these units has capacity of 650/1100/1750 c.f.m.; pressure 7 lbs.

Roots CONNERSVILLE SINCE 1854 *Aerating* BLOWERS

HEAVY-DUTY INCINERATION
MORSE BOULGER DESTRUCTORS

FOR THE

INCINERATION OF MUNICIPAL WASTES

GARBAGE, RUBBISH,

SEWAGE SCREENINGS

AND SLUDGE

O

FOR COMPLETE INFORMATION

CALL OR WRITE

MORSE BOULGER DESTRUCTOR CO.

HOME OFFICE:

205-W East 42nd St., New York 17, N. Y.

PLAN NOW FOR POST-WAR CIVIC IMPROVEMENTS

PITTSBURGH-DES MOINES

Pittsburgh-Des Moines engineers are "blue-printing" these civic improvements for forward-looking communities:

- Elevated Steel Tanks
- Steel Reservoirs
- Incineration Plants
- Steel Filtration Plants
- Steel Storage Tanks
- Steel Grandstands
- Steel Bridges

Let Pittsburgh-Des Moines engineers consult with you —for preliminary action on *your* post-war requirements!

PITTSBURGH · DES MOINES STEEL COMPANY

Pittsburgh, Pa. . . . 3418 Neville Island
Des Moines, Ia. . . . . 919 Tuttle Street

Composed of but a few simple parts, this factory-assembled single unit is presented in a 4-page folder showing a cutaway view of the Bellmaster joint, how it is installed, and listing ten important advantages of this fitting. Using but one tool, a Bellmaster joint can be installed easily, has great flexibility, insures tightness and permanence. For a complete description of the Dresser Bellmaster style 85, write to the Dresser Manufacturing Co., Bradford, Pa.

The Lakeside Spiraflo Clarifier, is described in bulletin 120 of the Lakeside Engineering Corporation of Chicago. This 4-page folder which discusses the general construction, operations, and advantages of the Spiraflo Clarifier, calls attention to its three-in-one action—skimming, flocculation, and clarification, and points out that the Spiraflo Clarifier is adapted to both water and sewage treatment, and is particularly excellent for use in primary clarification of sewage. Plan and elevation drawings indicate the construction of the clarifier. Bulletin 120 and additional information may be obtained from the Lakeside Engineering Corporation, 222 West Adams St., Chicago 6, Ill.

Victaulic Couplings and Fittings is the title of the very new and attractive Engineering Manual No. 44 of the Victaulic Co. of America. This catalog contains information on the flexible rubber gasketed Victaulic Coupling, its design, operating features, gasket features, housing design, installation, and full-flow fittings. Also presented are discussions of applications of Victaulic pipe couplings, elbows, tees, laterals, crosses, nipples and accessories in various industries with one section devoted to Water Works and Sewerage applications. Pictures are shown of installations on water supply mains, hydrant connections, valve settings, filter plants, sewer lines, sludge lines, outfalls, air lines, etc.

In addition there are pictures and diagrams with specifications, dimensions and discussion of steel pipe grooved, and fittings for valves, hydrants, meters and cast iron pipe. The manual which has as its primary objective, the pictorial review, the scope, the advantages of Victaulic Couplings, may be obtained by writing the Victaulic Co. of America, 30 Rockefeller Plaza, New York 20, N. Y.

Carter Self Priming Centrifugal Pumps are presented in Bulletin No. 4310 of the Ralph B. Carter Company, Hackensack, N. J. These

GOOD-TASTING WATER

Insures Public Satisfaction

Waterworks men who use Hydrodarco never have to worry about the taste of water. Hydrodarco—the activated carbon, made especially to remove odors and unpleasant tastes from water—adsorbs foreign elements to insure a high degree of palatability at satisfactory cost.

HYDRODARCO
REG. U. S. PAT. OFF.

DARCO CORPORATION

60 East 42nd Street, New York 17, N. Y.

Distributing Points: New York, Buffalo, Cincinnati, Chicago, St. Louis, Kansas City, San Francisco, Los Angeles, Marshall, Texas

self priming centrifugal pumps are advertised as "not the cheapest to buy, but the most profitable to own," and this bulletin shows how the Carter priming works, what close and long coupled units look like, details of construction of both close and long coupled units, pictures of construction variations, tables of pump sizes and ratings, diagrams of installations and applications. The latter include sump pumps, bilge pumps, fire, municipal, industrial, and private water supply service, mine pumping, gasoline or fuel oil pumps, dewatering pumps, pumps for vacuum cleaning swimming pools. Also shown in bulletin 4310 are other Carter pumps including portable units.

Alternating Siphons, as manufactured by the Ralph B. Carter Co., are described in Bulletin 4312. This four page folder points out that these automatic alternating siphons in single, double, and plural alternating types, are custom built to suit each particular job demand. Comments are made on their selection and design, discharge rates, and specifications. A table showing discharge capacities of deep seal siphons into open throughs is also included in the bulletin, as is a typical siphon layout.

Both of these bulletins may be obtained from the Ralph B. Carter Company, 53 Park Place, New York 7, N. Y., or 192 Atlantic St., Hackensack, N. J.

Micromax pH Records is a new catalog issued by Leeds & Northrup Company. It describes an equipment which consists of just two elements: an usually rugged glass-electrode assembly, and a Micromax Recorder—either a strip-chart Model S, or a round-chart Model R. Through the electrode assembly chamber flows a continuous sample of the process solution, where it completely covers the electrodes and a temperature compensator. The voltage thus set up is continuously measured by the Micromax, which indicates and records directly in pH units. Where operators should have an unusually bold guide to pH, the Model R is used. It indicates by means of a big pointer which moves around a large dial; in addition, draws a continuous record on a 24-hour chart. For a more detailed record of pH, over a longer period of time, the Model S is used. For a copy of Catalog N-96 (1), "Micromax pH Recorders," write to Leeds & Northrup Company, 4934 Stenton Ave., Philadelphia 44, Penna.

· 1879 ·

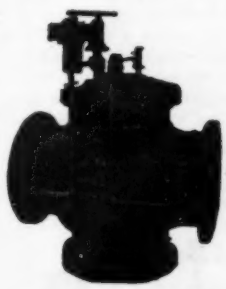
ROSS AUTOMATIC VALVES

ALTITUDE VALVES • SURGE • RELIEF • BACK PRESSURE VALVES

FLOAT VALVES • REDUCING AND REGULATING VALVES

ALTITUDE VALVES
for
Control of elevation and heads into and out of tanks, basins and reservoirs.
1. Single acting.
2. Double acting.
3. Combination assembly for three or more automatic operations.

COMBINATION VALVE
Combination automatic control both directions through the valve.
A self-contained unit, with three or more automatic controls.



REMOTE CONTROL VALVE
Electric remote control—solenoid or motor can be furnished.
Adapted for use as primary or secondary control on any of the hydraulically controlled or operated valves.

ROSS VALVE MFG. CO.
INCORPORATED
P. O. BOX 595, TROY, N. Y.

HYDRO-TITE

HYDRO-TITE — The self-caulking joint compound that makes cast iron water pipe joints — strong — tight — flexible and everlasting. Used on thousands of miles of pipe with a record of more than 30 years without a failure.

•

FIBREX — The sanitary paper packing that is used like braided jute. Free from bacteria — treated with a water repellent — put up in 60 pound reels. 70 pounds of Fibrex takes the place of 100 pounds of braided jute.

•

HYDRAULIC DEVELOPMENT CORPORATION
50 Church St.
New York, N. Y.

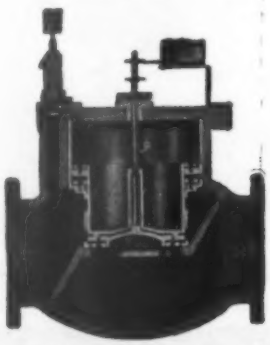
DRY BRAIDED
Fibrex

Electric
Double Cushioned
Check Valve

This valve is for use in connection with remote tank storage service with valve located adjacent to motor centrifugal pump, also where a high-low pressure or float-operated switch located at tank is wired to the valve in order to accomplish complete automatic sequence of operation for starting and stopping the pump with respect to storage water levels.

Sizes 3" to 36", angle and globe patterns.

Write for specifications.



GOLDEN-ANDERSON
VALVE SPECIALTY CO.
Fulton Building Pittsburgh, Pa.

Bulletin 77 of Chem Feeds Inc. describes the Var-I-Feeder, a portable, light-weight chemical solution feeder. The aims in manufacturing this feeder have been toward further compacting of chem feed apparatus, making its operation more convenient, improving the method of control and adjustment, and reducing cost to the user without sacrifice of quality or dependability. The bulletin shows some of the innovations embodied in the Var-I-Feeder, including high-speed midget size; "right-side up" reagent head; finger tip control of speed and feed while in motion; and illuminated instrument type control panel; as well as check valve design, compactness, and type of drives, among many other interesting features. This bulletin or further information on the chemical control feeder which "tunes" like a radio may be obtained by writing Chem Feeds Inc., 77 Reservoir Ave., Providence, R. I.

Marlow Pumps, self priming centrifugal diaphragm and plunger pumps, are presented in Cat. P43 of the Marlow Pump Co. of Ridgewood, N. J. This forty page catalog is divided into seven sections including Manufacturing Information; Self-priming Centrifugal Gasoline Pumps, Portable; High Pressure Self-Priming Pumps; Electrical and Belt Drive Pumps; Diaphragm and Plunger Pumps; Engineering Data and How to select the correct pump; and index with general information.

A companion piece, Cat. S43, is a six page folder showing the outstanding features of the Marlow Sludge Pumps. Either or both of these catalogs, P43 or S43, may be obtained by writing Marlow Pumps, Ridgewood, N. J., or to their Sales Representative, the Pacific Flush Tank Co., Chicago, Ill.

In the March issue of the **Taste and Odor Control Journal,** published monthly by the Industrial Chemical Sales Division of the West Virginia Pulp and Paper Company, is a review of the USPHS survey on the extent of use of activated carbon. This paper, originally presented by E. A. Sigworth at the 1943 AWWA meeting in Cleveland, is a good reference paper on the application of activated carbon. A table of general data indicates that in 842 plants having a daily output of 2,774 mgd., the average carbon dosage is 10.6 lbs. per mil. gal.

Arranged according to sources of supply, it appears that 335 plants using river water average 8.8 lbs. per mil. gal., and 182 plants using creek water average 12.7 lbs. per mil. gal., while 325 plants using lake and reservoir average 12.8 lbs. per mil. gal.

Arranged as to size of plants, it appears that 364 plants produce 0.5 mgd., and average 20.3 lbs. of carbon per mil. gal.; 170 plants pump from 0.5 to 1.0 mgd. and use 12.2 lbs. of carbon per mil. gal.; 260 plants pump from 1.0 to 10.0 mgd. and use 16 lbs. of carbon per mil. gal.; while 48 plants pumping 10 million gallons or more average 7.6 lbs. per mil. gal.

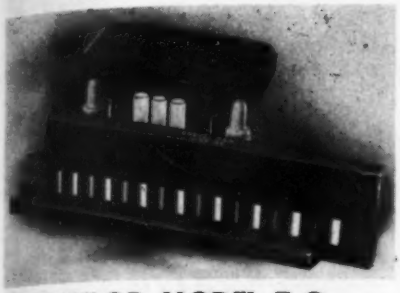
The 842 plants covered in the summary represent 72 per cent of the users of activated carbon within the United States, and all of the data on carbon usage given above is average based on annual output.

Bitumastic Blacks and **Bitumastic Visual Index** are the latest folders of the Wailes Dove-Hermiston Corp. of Westfield, N. J. In the former is described the product, Bitumastic Black Solution for the protective coating of tanks and other metal surfaces. The Bitumastic Visual Index is a four page folder which shows in diagrams of industrial plants where different bitumastic coatings may be applied and are recommended for use. These protective coatings include Bitumastic Black Solution, Bitumastic No. 50, Bitumastic Super-Service Black, and Bitumastic Tank Solution. Either or both of these bulletins may be obtained from the Wailes Dove-Hermiston Corp., Westfield, N. J.

Electronic Motor Drives, as manufactured by Electron Equipment Corp., of Pasadena, Cal., are shown in a recently issued Catalog Sheet 175 of that company. These electronic motor drives operate D. C. motors from 1 to 250 H. P. on A. C. lines with precision speed control. Speed ratios as high as 100 to 1 and efficiencies up to 95 per cent are obtained. Illustrated in the catalog sheet is the compact Eleco variable speed control made for large D. C. motors driving heavy machine installations. No special motor is required. Any shunt wound D. C. motor will operate with the Eleco RPM Control from a 3-phase 60-cycle line. For further information write Electron Equipment Corporation, 917 Meridian Ave., South Pasadena, California.

Chapmanizing Steel, an Accepted Method for Surface Hardening Steel, is described in a twelve page folder under that title. Diagrams and data are presented to show that Chapmanized products are stronger. Also presented is information where Chapmanizing can be used and how

Shows pH in 60 Seconds!



TAYLOR MODEL T-O
for Accurate pH Control

Engineers with an eye to efficiency and economy stick to the Taylor Model T-O Comparator. This dependable outfit has more than proved its ruggedness, adaptability and accuracy under all sorts of conditions.

Determinations are made by placing the sample in 3 of the test tubes, adding indicator solution to the middle one. You then move non-warping plastic slide until color match is obtained, and read off the exact pH directly from the values engraved on the slide. Accuracy is assured, for all Taylor liquid color standards carry AN UNLIMITED GUARANTEE AGAINST FADING.

Model T-O, complete with one slide...$16.00 F.O.B., Baltimore
Additional Slides....$8.00 each

See Your Dealer or Write Direct for FREE Booklet—Modern pH and Chlorine Control

W. A. TAYLOR AND CO.
7308 YORK RD. • BALTIMORE 4, MD.

WRITE FOR INFORMATION

VOGT BROTHERS TRAFFIC MODEL FIRE HYDRANT

A.W.W.A.

VOGT BROTHERS MFG. CO.
MAIN AT 14th LOUISVILLE KY

VOGT

VOGT MFG. CO., Incorporated
P. O. BOX 1122 LOUISVILLE KY

AERO-MIX

AERATOR—MIXER

A Size and Type to Fit Your Problem in Water or Sewage Treatment.

WRITE FOR INFORMATION

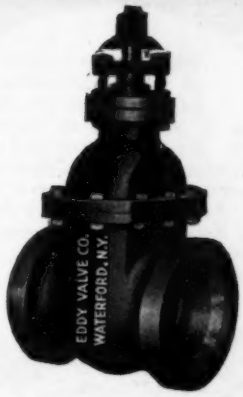
Chapmanizing is accomplished. The latter describes the process, reaction, bath, operation, and stability of the bath. Photographs show the items which may be Chapmanized and penetrations of the case hardening depths, as well as magnifications of the etched iron. One page of the booklet is devoted to telling how manufacturers can obtain Chapmanizing for their own uses with information on equipment, contract service, and costs. This booklet or further information on Chapmanizing may be obtained from the Chapman Valve Manufacturing Co., Indian Orchard, Mass.

Roccal and Ramuc are featured by the Inertol Company, Inc., of Newark, N. J., in a four page folder recently issued. Ramuc is a swimming pool enamel with a number of outstanding characteristics. Roccal is a chemical distributed by the Inertol Company for the improvement of appearance and sanitary conditions of swimming pools by controling slime and algal growth. Roccal will inhibit algal growths, at the same time being safe, stable, and imparting no taste or odor to the water. Used in the ratio of one gallon to 50,000 gallons of raw water for the first application, only one quart is required for the same volume every five to ten days. This folder describing these two swimming pool products may be obtained from the Inertol Company, Inc., 470 Frelinghuysen Ave., Newark 5, New Jersey.

CATL-AD No. 44 is a six page folder of Watts protective devices. In this folder are shown relief valves, pressure reducing valves, water tempering devices, hot water heating systems, boiler water feeders, low water cut-offs, and steam regulator specialties. This catalog is in effect an announcement that these items are now being supplied to dealers. Catl-Ad No. 44 may be obtained from the Watts Regulator Company, Lawrence, Mass.

Bulletin A-52 is a new 56 page two-color bulletin offered by the Sullivan Machinery Co. of Michigan City, Indiana. This bulletin describes heavy duty, two-stage compressors. Four classes, comprising 18 sizes, are described. The amply illustrated bulletin shows many of the installations; gives full description of the available sizes, types and drives and of construction detail; also information as to foundation requirements, regulations, accessories and servicing. Write to the Sullivan Machinery Co., Michigan City, Ind., for Bulletin A-52.

EDDY
FIRE HYDRANTS
AND VALVES
WATER WORKS EQUIPMENT



EDDY VALVES
For
Water Works
and
Sewage Disposal
Plants

EDDY FIRE HYDRANTS
For Fire Protection Service

Write for Complete Catalog

Eddy
VALVE COMPANY
WATERFORD, N. Y.

INQUIRIES INVITED
on all Problems of
WATER TREATMENT

Whether your problem of water rectification is large or small, we have a form of equipment to serve your needs. We manufacture and install equipment for Gravity Filtration and Softening Plants; Pressure Filters and Zeolite Softeners; Swimming Pool Recirculating Appliances; and Water Treatment Units of all types.

ROBERTS FILTER MFG. CO.
607 COLUMBIA AVE.
DARBY, PA.

Over 225 P. F. T. Floating Covers in War Service

The health of our fighting men and war workers is being safeguarded by modern sewage disposal plants. We are doing our part by delivering on time P.F.T. Floating Covers and other sewage treatment equipment.

The P.F.T. Floating Cover for single and stage digestion hastens the digestion process, and provides for utilizing the sewage gas to heat water for the digester tank.

Catalog No. 232 contains complete information, including specifications. Write for your copy.

P.F.T. PACIFIC FLUSH-TANK CO.
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Wire Grommet V-Belts offer greater strength and longer life, according to a 4-page folder recently issued by The B. F. Goodrich Company. The Wire Grommet V-Belt, an exclusive development, consists of twin cores of endless steel wire twisted on itself to form the grommets, which are kept at a uniform distance from the sides of the belt through its length. The grommets are covered with counter-balancing and insulated cord. These belts are built with high tensile strength, resiliency, assure little permanent stretch, and allow a considerable increase in horsepower ratings over the conventional type V-belts. The belt is furnished only on special jobs where it has been decided by belting engineers that standard belting cannot be used. The folder describing these belts may be obtained from The B. F. Goodrich Company, Akron, Ohio.

Hot Process Water Softener by C. E. Joos is reprint No. 30 of the Cochrane Corporation. Reprinted from "Iron and Steel Engineer" for October 1943, the article covers a brief history of the development of this method of feed water conditioning. Following the historical presentation, the chemical reagents are discussed and new improvements of both chemical and mechanical nature. Illustrations show the possibilities of silica removal, reduction of organic matter, and typical installations of this equipment.

Copy of reprint No. 30 may be obtained from Cochrane Corp., 17th & Allegheny Ave., Philadelphia 32, Pa.

E-M Synchronous Motors are presented by Electric Machinery Manufacturing in Publication No. 173 of that company. Various "extra value" E-M synchronous motor features are shown and described, including special features of the rotor, the bearings, and the stator. Also shown in the folder is the E-M Synchronous Motor Control. This publication No. 173 on E-M Synchronous Motors may be obtained from the Electric Machinery Manufacturing Co., Minneapolis 13, Minn.

"No Need to Put Up with Dim Glims Any More" is the heading of a 4-page folder issued by the Ideal Commutator Dresser Co., Sycamore, Ill. Utilizing lively cartoon illustrations, the folder "puts a smile" into instructions for using the rechargeable batteries for flashlights or lanterns. Accompanying the cartoons are word descriptions of the items receiving emphasis; such as how

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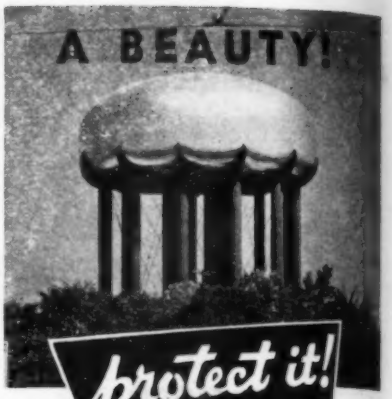

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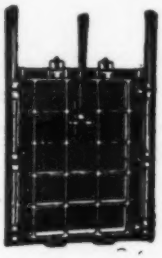

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This interesting as well as informative and amusing folder may be obtained from the Ideal Commutator Dresser Co., Sycamore, Ill.

Bulletin No. 4320 may be obtained from Schramm, Inc., West Chester, Pa.

Form Engineering by Williams Form Engineering Co. of Grand Rapids, Mich., is presented in a catalog of that title. Included in the catalog are prices, sizes, design and applicability of all types of clamps, ties, anchors, cone spacers, bearing brackets, and other items developed by the Williams company to insure the proper and successful construction of forms for concrete work. For any person interested in concrete structures and the erection of forms therefor, this catalog shows every conceivable piece of equipment that can be an aid to that work. "Form Engineering" may be obtained from the Williams Form Engineering Corp., Box 925, Madison Square Sta., Grand Rapids 7, Mich.

Texrope F/HP V Belt Drive is a new 44-page bulletin released by Allis-Chalmers Co., Milwaukee, on fractional horsepower Texrope V belts and sheaves. Bulletin B6249 contains engineering data and working formulas from which correctly engineered fractional-horsepower drives may be easily derived. The bulletin is illustrated with installation photographs, line drawings, and contains selection tables. For complete information on fractional-horsepower drives, send for Bulletin B6249, Allis-Chalmers Manufacturing Co., Milwaukee 1, Wis.

Water Bath and Dry Heat Sterilizers, as produced by the Electric Hotpack Company of Fox Chase, Pa., are presented in a catalog containing complete data on these items. Various models of constant-temperature water baths, gravity-convected and mechanically-convected dry heat sterilizers and electric drying ovens are shown in detailed illustrations. Specifications and tables are given for easy reference, and various applications as well as performance ranges are also listed. This catalog may be had on request to the Electric Hotpack Co., Inc., 1229 Cottman St., Fox Chase, Pa.

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14	2.5	7.00	2.25	24.02
16	2.5	8.25	2.25	33.07
18	2.5	9.25	2.25	36.88
20	2.5	10.50	2.25	40.71
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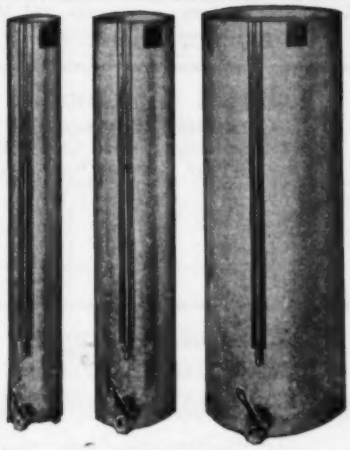

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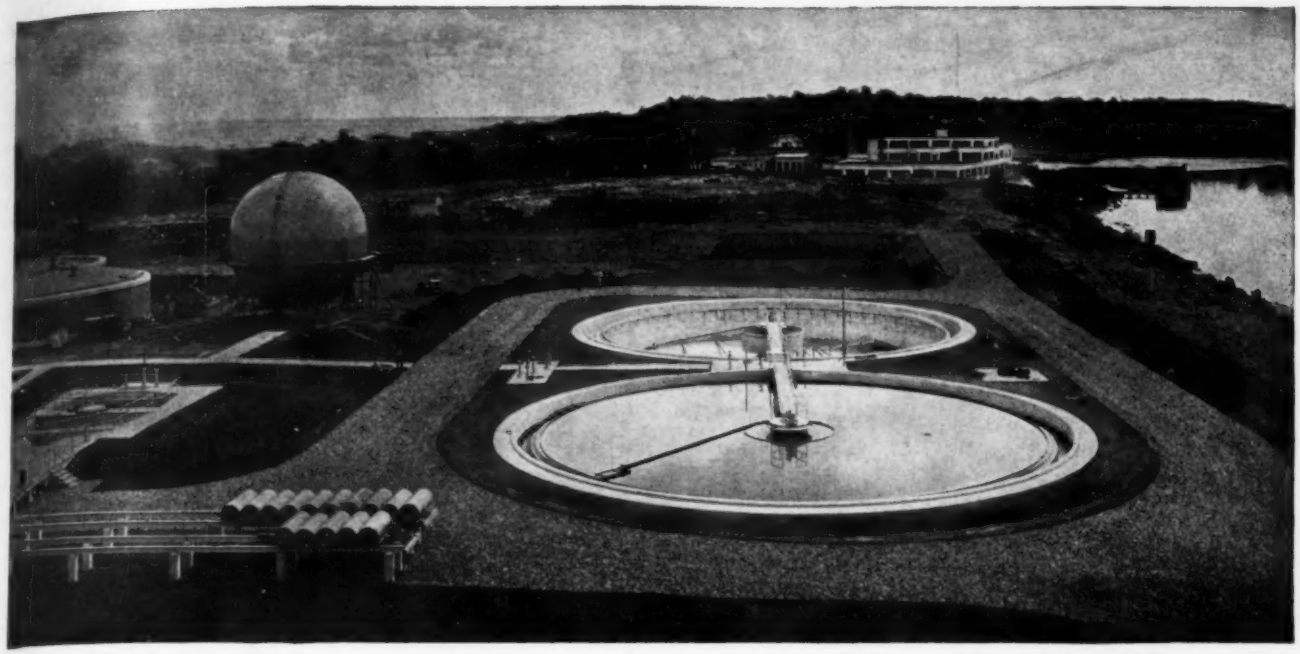

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